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HYGEIA—THE GREEK GODDESS OF HEALTH.

The International Journal of Orthodontia

Editor: Martin Dewey, D.D.S., M.D.

VOL. I ST. LOUIS, SEPTEMBER, 1915 NO. 9

ORIGINAL ARTICLES

THE HISTORY OF ORTHODONTIA.

BY BERNHARD WOLF WEINBERGER, D.D.S.
NEW YORK CITY.

PART I.

"All history becomes subjective; in other words, there is properly no History: only Biography."[1]

Introduction.

"As man has an ever-recurring proness to make himself the standard of the truth, to condemn, sneer at, and despise all that he does not choose or is unable to comprehend, so in a greater degree every generation of men admires its own wisdom, skill, science, art and progress; it calls its own whatever it has learnt from men of former days, and counts the few improvements which have had their birth in its own time as triumphs and distinctions which elevates it above the past. If we consider the history of ages gone by, these high pretentions will soon abate somewhat of their confidence. The progress of those contrivances towards our comfort which we sum up in the term civilization, has been very creeping and laborious."[2]

"In the search for the origin of any phenomenon of civilization the investigator strives to bridge over historical time, which represents a certain height upon the ladder of evolution rather than its lowest rung, and seeks the earliest manifestations, even though these are seen dimly and in uncertain outlines."[3]

If there is one phase of the present day "healing art" that many believe to be of very recent development, it is dentistry. What basis then is there for presuming that orthodontia was found in "The Mythical Period"? Pro-

1. Emerson on History.
2. Cockayne, Thos. Oswald, Leechdoms, Wortcunning, and Starcraft, 1864.
3. Neuburger: History of Medicine, 1910.

(Copyright, 1915, by Dr. Bernhard W. Weinberger.)

bably many would declare that the science and art of dentistry, as it is known today, was developed for the first time in the world's history within the last generation or two.

In the light of modern progress, it is interesting to know that the practitioner of today believes he is doing something heretofore never practiced, yet we find that dentistry, both as an art and science, finds its place in the earliest medical treatises. Research shows, and proves, that the very materials, gold, silver, etc., must have found like employment in our profession, in the remote days. Prosthetic pieces, skulls, and teeth have been discovered to prove actual accomplishment of earlier dentistry. So we also learn malocclusion of the teeth, orthodontia, was practiced with instruments, and there are extant directions for treatment for the practitioner's use in this science.

Tracing the scientific work in dentistry during the ancient and medieval ages, a gradual development along with that of surgery is found. Dentistry shared to such a degree with surgery, that several writers on kindred subjects apparently anticipated many of the supposedly modern developments. The correction of malocclusion of the teeth has always been considered a modern achievement, but it will be shown that is is far more ancient than is generally supposed. When and by whom dentistry was first practiced, history, as far as we read it, fails to record, but there are ample proofs, that efforts were made by the Romans, Arabians, and South American Indians in this direction.

Although the practical growth in dentistry has occurred during the last hundred years, we hardly find any material progress in this science until within the last half century and it is only since then that real interest has been aroused, and noticeable advancement made in this branch.

Every important science must be correlative to another. In tracing the evolution of our specialty, it becomes necessary to start at its origin, the basic principle upon which it is founded, and at the same time to mention some of the men who have contributed towards its development. The history of orthodontia is largely the history of dentistry; that of dentistry, the history of medicine, science and philosophy. As the growth and evolution of peoples has been more or less on parallel lines with art and science, neither having been created suddenly, but the result of slow progress; so in its initial stages, we trace medicine, surgery and dentistry simultaneously.

The earliest faiths in the world attributed origin to the gods, associating medicine with the office of religious worship; gods being named as their first physicians. Every country, possessing records of its past history shows some accounts of medicine and dentistry. The history of dentistry embraces times during which medicine and dentistry were not sciences, but a collection of vaguely described traditions.

Although dentistry existed at a remote period, it cannot be determined to what extent it was practiced, or how near perfect it was, since the earlier records were either lost at the destruction of the Alexandrian library or through the struggles of "The Dark Ages". However, there has been unearthed enough to show that there were some elaborate mechanical works, and extensive knowledge on this subject.

The teeth found in the jaws of prehistoric skeletons do not often show

signs of caries, but those that do, apparently belonged to men well advanced in years. Yet abrasions caused by use or mechanical wear were frequent. The "wearing" no doubt was due to the nature of food, which was frequently eaten raw, and was in consequence exceedingly difficult to masticate. During this period, it was "the survival of the fittest" and evidence shows that man suffered slightly from caries; those that did must have practiced extraction by means of the finger and thumb, the natural forceps of prehistoric man, with the alternative step of seeking the aid of an herb to soothe the pain.

The significance of the work of a profession and its true value and position with regard to humanity, is first made clear to us through history. Only after we have reviewed the labors of thousands of years and have seen how our science has advanced, can we appreciate the work of the individual and the part he has done, "Much arises which has already perished, and what is now honored is already declining"—this is probably as true in dentistry and orthodontia as in medicine and other sciences.

"Millions on millions have perished without contributing to the progress of science; they have no history. Thousands have promoted at least the foundation of future knowledge, history records their names, for they laboured. They summed up the past and discovered new and great truths, the intellectual products of many bygone factors of knowledge; they led humanity onward, and thus formed the landmarks of its history".[1]

Orthodontia has a history which is old; in order to give a more ideal conception to its calling, and with the hope that the knowledge of the past will be a greater aid to "the profession", in the future, this history must have for its foundation, medicine, then dentistry, and last orthodontia.

Accordingly this work will be treated in four sections;

First Period.—Primitive Medicine and Dentistry. (0000-1530.)

Second Period.—Dentistry from its first work "Zahnarzney" (1530-1728.)

Third Period.—Modern Dentistry.—Time of Fauchard to Farrar and Kingsely. (1729-1870.)

Fourth Period.—Modern Orthodontia. (1870-1900).

SECTION I.

Primitive Medicine and Dentistry.

The earliest authentic records of medicine are perhaps found in the scripture. There may be gathered some idea of the knowledge and practice of medicine among the Egyptians. Pliny traces the origin to them, others claim to have traced it to the Chinese and Arabians.

Ancient Medicine and Dentistry of the Chinese and Japanese.—The records of the Chinese are lost through tradition; for over four thousand years their laws, science, language, manners and customs have remained almost unchanged. From the earliest time their rulers had taken the greatest care to prevent contact with the outside world. It is not surprising that a people, who held their dead so sacred, and considered dissection sacrilegious, would know little of the human anatomy or physiology. Never-

1. Bass, John H.: The History of Medicine.

theless it is believed that the Chinese excelled in medicine and dentistry at an earlier date than any of the other races.

Their literature consists of a large number of books, none of which are of scientific value. In Europe many of the works of the Chinese have been translated, and several chapters devoted to dentistry are recorded. A number of creditable books on Materia Medica have been found, written by the various Emperors. "Chinese pathology is characterized by an excessive amount of detail; for example, 10,000 varieties of fever or 14 kinds of dysentery. The ancient Chinese knew of preventive inoculation against smallpox, which they probably obtained from India."[1]

In a work[2] supposed to have been written by the Emperor Houang-Ti, founder of Chinese Medicine, and who is supposed to have lived 2637 B. C., two chapters are devoted to diseases of the mouth. One was devoted to toothache, the other treated other dental and gingival diseases. Nine types of toothache were recognized. Among the remedies to relieve this, were pills made of powdered garlic; animals, such as bats, were prescribed to be taken as a preventative of caries, and the excrement of the bat in powder was used to whiten the teeth. Medicine for the relief of toothache was either inserted into the ear or nostril. "Roast a bit of garlic and crush it between the teeth, mix with chopped horseradish seeds, make into a paste with human milk, form pills and introduce one into the nostril on the opposite side to where the pain is felt."

Swollen gums, abscesses and ulcerations are spoken of as follows: "It sometimes occurs that an abscess forms in some one point of the gum; this communicates great pain to the tooth near it; the abscess is white, with discharges of purulent matter." The remedies prescribed were usually herbs; mint and rhubarb being the favorites.

Where the inferior maxillary had been fractured the method of curing same is described as follows: "With the hands one brings the two parts together, and applies an apparatus of small bamboos which is left in position until the cure is complete. At the same time, take a fowl which has been plucked, and from which the bones have been removed, add a few onions, then pulverise it and apply the powder to the affected parts." They were taught, as most of the earlier writers thought, that caries of the teeth were produced by worms.

The Chinese also claim to have been able for thousands of years to produce anæsthesia by means of the preparation "moxa."

Japanese.—The methods and treatment adopted by the Japanese for dealing with dental troubles, was very similar to those in use by the Chinese. The oldest Japanese work is Ishinho, written by Yasuhori Tambu in 892 B. C. In Japan, the "moxa" was more generally in use than in China.

"The Japanese native dentist who traveled the country is said to have been very expert in extracting teeth, using his fingers only for this purpose without the help of any instrument. His methods was to seize the head of the patient at the corner of the lower jaw in such a manner that the mouth was forced to remain open. Then, plunging the thumb and first finger of the other hand into the patient's mouth, he extracted as many

1. Garrison, Fielding H.: An Introduction to the History of Medicine, 1913.
2. Dabry, P. P.: La Medecine chez les Chinois, 1863.

teeth as he thought necessary. The method of training the dental operator in this form of extraction is somewhat interesting, and is said to have been carried out as follows: In a plank of soft wood a number of holes were made and into each a plug was forced. The plank was then placed on the ground, and the student was told to seize with the thumb and first finger of his right hand the plugs, and pull them out without moving the plank. After this exercise has been practiced several times, a harder wood was substituted and the exercise repeated, the plugs being fixed more tightly each time. When the student succeeded with the last test, he was said to be fit to pursue his calling."

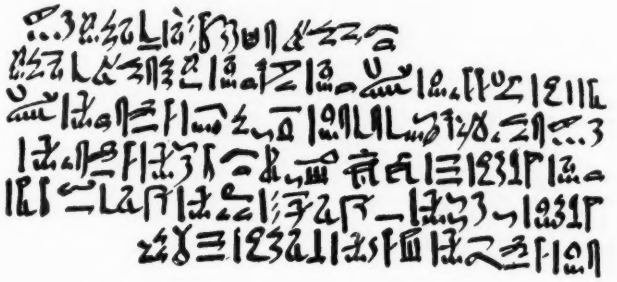

Fig. 1.—Three dental recipes from Ebers' Papyrus.

The Dental Art in Ancient Egypt.—Our knowledge of medicine and the dental art of the Egyptians was derived largely from the various papyri, the Brugsch, the Ebers, and the Hearst, but even antedating these are certain pictures engraved upon pillars of stone, and found in the burial grounds near Memphis and described by their discoverer, W. Max Müller,[1] as being the earliest known pictures of surgical operations. (2500 B. C.) Near the pyramids of Sakarah, is the resting place of the practitioner I-en-Hetep, the earliest known physician. (4500 B. C.)

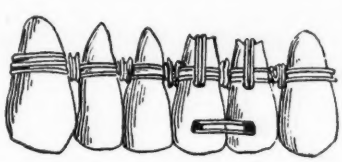

Fig. 2.—Artificial teeth, probably Egyptian or Phoenician, excavated at Saidon.

The earliest work and most important of the medical papyri, that has been translated, was that discovered by George Ebers and described by him as a medical compilation commenced about 3700 and ending about 1556 B. C., at Thebes in 1872. This consisted of 110 pages of hieratic or cursive script, the text in black letters, the rubrics in red. The references to dental diseases in the papyri are numerous, and include gingivitis, erosion, pulpitis and "toothache". For the cure of these conditions many prescriptions are given in the forms of plasters and vegetables decoctions (Fig. 1). One of these called for equal parts of a powder from the fruit of palms, green lead, powdered flint stones and honey.[2] This is to be rubbed on the teeth

1. Mueller, W. Max: Egyptological Researcher, Wash. Carnegie Institution, 1906.
2. Joachim, Heinrich: Papyrus Ebers, Berlin, 1890.

to strengthen them. Many recipes are recorded for "strengthening the teeth," also chewing remedies for stopping the toothache and for curing "the gnawing of the blood of teeth", probably due to caries and pulpitis.

For tightening loose teeth, a mixture of powdered palm fruit, coarse lead and honey is recommended. By rubbing this on the gums vigorously, the pain is relieved. Inflamed gums and bleeding was stopped by a plaster of goose-grease and honey.

Fig. 3—Phoenician vase. Extracting a tooth.

Extraction is not recorded throughout the papyrus, however, there is evidence that the Egyptian must have known how to perform this operation. One finds no mention of dental surgery in the Ebers papyrus, however, as the use of the knife and of the red hot iron for the treatment of abscess and of certain tumors is recorded, the Egyptian must have had some knowledge of same.

Although there is no mention made in the papyrus of any dental operation, Herodotus, who visited Egypt about the year 450, speaks of dentists, but little pertaining to the filling of the teeth. Nevertheless dental art in Egypt must have made remarkable progress, having been practiced by specialists.

According to Herodotus, dental art among the Egyptians from its earliest period was reserved to a particular class of persons, but regarding their anatomical knowledge or proficiency in same, we have little information.

"There is an individual healer for each individual ailment, hence the whole country is filled with healers, some taking charge of the diseases of the head, others of those of the eye, others of those of the teeth ....". "Thus we find Medicine divided amongst them, each physician applies himself to one disease only and not more. The beginning of specialization."[1]

He also relates how the sick were taken to public squares, in "order that any who passed by, and had been similarly attacked, might give their advice for the benefit of the sufferers. Later all who were cured were required to go to the Temples and there inscribe their symptoms and the treatment that proved successful." From this humble origin developed the greatest of sciences, Medicine.

Fig. 4.—Skull with teeth inlaid with gold, from Atacames, Esmeraldas, Ecuador. (In the Heye Museum.)

At a time we find amongst the Egyptians gold was used, but there is little evidence to show it was for the purpose of filling teeth. Wilkinson remarks that he had seen teeth of Egyptian mummies "stopped" with gold, but existing specimens are not known. Prof. Ebers in his wide research found no trace of such specimens. Emil Schmidt of Leipzig in regards to his collection of several hundred mummy skulls wrote: "In no jaw have I found anything that could be attributed to the work of dentists: no fillings, no filing or trepanning of teeth, no prothesis."[2]

Prof. R. Virchow in his examination of old Egyptian skulls, many of them royal skulls including that of Ramesis II, found no indication of dentist's handiwork.[3]

The earliest artificial denture probably of Egyptian, is that discovered by Gaillardot and described by Renan in his "*Mission de Phenicic*," the result of researches made in the necropolis of Saidon. Dr. Gaillardot found a quantity of small objects in a grave, among them a "part of the upper jaw of a woman with the two canines, and the four incisors joined together with gold wire (now in the Louvre at Paris); two of the incisors would appear to have belonged to another individual, and to have been applied as substitutes for lost teeth. This piece, discovered in one of the most ancient tombs of the necropolis proves that dental art in Saidon was sufficiently advanced". (Fig. 2.)

1. Herodoti Halicarnassii Historia, 1570 fol. Eutirpi.
2. Geist-Jacobi: Geschichte der Zahnheilkunde.
3. Ibid.

It is evident that these artificial teeth could not have been used for the purpose of mastication, but were inserted presumably as ornaments to fill the space left by natural teeth that were either extracted or had been lost. Thus it may be said that Egypt undoubtedly was the birthplace of dentistry, as a distinctive branch of the healing art.

Fig. 5.—Skull with teeth inlaid with gold, from Atacames, Esmeraldas, Ecuador. (In the British Museum.)

Phoenicians.—The Etruscans and Hindoos as well as the Egyptians, used artificial teeth, some made of wood; others wood covered with gold, and held in position by gold or silver wire. Dentistry must have been practiced by the Phoenicians, who no doubt were influenced by the Egyptians, their neighbors. Egypt, being the seat of culture and of learning, drew students from every land in search of knowledge and skill. From the cities of Tyre and Saidon, no doubt there came those who in turn carried back to their homes whatever knowledge of dentistry they acquired. "The ancestors of the Phoenicans, who were settled for an unknown period on the shores of the Persian coast, possessed universities as early as 2000 B. C. The Phoenicians were, as we know, the inventors of writing, an art which, when compared with the Egyptian hieroglyphics and the Assyrian cuneiform writing, may claim for ancient and medieval times the same importance in the history of civilization as the art of printing compared with the handwriting in vogue up to the period of its discovery."[1]

Of the dental art possessed by these people, we know little. The appliance found at Saidon (Fig. 2), and the Phoenician vase (Fig. 3),[2] upon

1. Bass: The History of Medicine,
2. Cigrand: Rise, Fall and Revival of Dental Prothesis,

which is represented the primitive method of extraction, are the means by which we must base our conclusion, but these two examples amply illustrate the knowledge of dentistry they possessed.

Dental Customs Among the Primitive People.—The teeth have also been artificially modified for religious, beauty or other reasons. Certain tribes of India, according to Murphy,[1] separate the permanent teeth with a file, others attempted to bring all the teeth to a uniform level. In Sumatra many of the women filed their teeth down to the gingival margin, while others to a point, partially removing the enamel and applying dyes for personal decorations. The men were accustomed to dye the upper teeth black, covering the lower ones with gold. The natives of other islands gilded the upper central incisors, dyeing the others black.[2]

Fig. 6.—Skull with teeth overlaid with gold, from La Piedra, Esmeraldas, Ecuador. (In the Heye Museum.)

It was the custom of the married women of Sumatra, Japan, and other islands, and the maidens of Java to blacken their teeth. In Java, artificial teeth of gold or silver have long been known and a custom exists of covering certain teeth with fine gold plates to contrast with those dyed black.[3]

The natives of the Sandwich Islands used to knock out their front teeth as a sacrifice to the God, Eatoa, and the aborigines of New South Wales, and certain tribes of Indians in Peru, had their front teeth knocked out with a stone on arriving at manhood.[4]

Prof. Saville,[5] in his explorations in the Province of Esmeraldas in North Ecuador, excavated a number of skulls, showing these same customs pre-

1. Murphy, Joseph: A Natural History of the Human Teeth", London, 1811.
2. Linderer: Die Zahnheilkunde, 1857.
3. Bontii, J.: De Medicine Inclorum, 1642.
4. Carabelli: Handbuch der Zahnheilkunde, 1844.
5. Saville, M. H.: Pre-Columbian Decoration of the Teeth in Ecuador, American Anthropologist, July, 1913. p. 377.

vailed among the pre-Incas tribe of South American Indians. These skulls exhibited a high stage of development of dentistry, and as the casting of inlays was presumed to be of recent date, the work displayed by this primitive race, is all the more remarkable. "The skulls showed that the men were of a type superior to Aztecs. Besides the better shape of the skull, the teeth were often filled with gold and cement, proving that dentistry was at a high stage of development among the early residents in Ecuador thousands of years ago." "Another custom which we have found in Esmeraldas, and which, so far as we are aware, is not present in any other part of South

Fig. 7.—Skull with teeth inlaid with Jadeite, from Chal-Chicomula, Puebla, Mexico. (In the Ethnographical Museum of Munich.)

America, is the decoration of the teeth by the insertion of inlays in small perforations cut in the enamel of the upper incisors. This custom of decorating the teeth was quite common in various parts of Mexico, where different settings were used. In the Mayan area, as far south as Salvador, the object most often used for inlay was jadeite. In Mexico, I have found hematite used, in Vera Cruz, turquoise has been found; and in the other parts, teeth with settings of rock crystal, obsidian, and a red cement, have been found." "The upper middle teeth are decorated by the insertion of thin gold discs in cavities drilled or bored in the enamel upon the face of the teeth. An unusual dental feat, in addition to the decoration, is found in the right middle tooth. This is not a right middle incisor, but a right lateral incisor, which does not belong to the jaw but was implanted to replace the

middle incisor. This is such an extraordinary feature that we must weigh very carefully the evidence as to its having been found in the jaw. Everything is in favor of this position, indeed there is no reason to doubt that the replacement is a genuine pre-columbian triumph of the ancient dentist of Atacames.

"The tooth fits perfectly into the socket, although as a matter of course, it is not so long as the cavity, this space at the end being proof that the original tooth was replaced by the implanted one only a short time before death, otherwise the growth of bone would have filled it."[1]

Another example of early implanted teeth in ancient America has been described by Dr. Andrews,[2] "The most interesting dental curiosity in the collection is an implanted tooth, made of some dark stone. It was found neatly fitted in the sockets of an inferior left lateral incisor, and is shaped very much like the natural tooth. That it had been worn for some time during life was indicated by the thick incrustation of tartar upon it."

As extraordinary as these admirable successful attempts at implantations, no less remarkable are the wonderful inlays that have been unearthed in the various explorations in South America.

The skull found by Prof. Saville is not only historically interesting for the remarkable implantation found contained therein, but for the occurence of decorated teeth and gold inlays. "The setting of the implanted left middle incisor of the Atacames specimen under consideration (Fig. 4), is a little larger than that in the right tooth, being a slightly irregular disc 6.5 mm. in diameter, while the other inlay, a perfect disc, is only 5 mm. in diameter. The smaller disc, however, is slightly thicker than the larger one, being less than 5 mm. in thickness, the other being 3 mm. The surfaces of the inlays are flat and polished. The larger one projects below the edge of the central part of the tooth, and viewing it from the inside, it appears to have been filed, and thus decorated before the insertion of the inlay."[3]

From the collection of skulls found containing inlayed teeth, one learns that the number of teeth decorated was variable. The one discovered and described above contained two, while Fig. 5, from the British Museum, shows a skull formerly containing eight gold inlays in the upper jaw, decorating the four incisors, the two canines, and the two premolars.

Another interesting example of tooth ornamentation is a skull with teeth overlaid with gold, from La Piedra, Ecuador, and now in the Heye Museum, New York. The decoration of the teeth is unique and presents a new type of facial ornamentation. "Instead of small discs being set into artificial cavities, we find in this case, as shown in Fig. 6, that certain teeth of the upper jaw were almost entirely covered on the outer face by an *overlay* of gold. The entire enamel of the teeth decorated has been removed, with the exception of narrow bands at the basis and the upper parts where they were close to the flesh and imbedded in the jaw. The removal of the enamel is through to the dentine and was skillfully accomplished. It appears that in some instances sawing was done slightly under the enamel at the

1. Andrews, R. R.: Prehistoric American Dentistry, Dental Practitioner, 1893.
2. Upon examining this specimen recently, find that the tooth was not only implanted, but there is every indication of root amputation having been practiced. Approximately a quarter of an inch of the root being removed with the surface perfectly smooth and even.
3. Saville, M. H.: Pre-Columbian Decoration of the Teeth in Ecuador, American Anthropologist, July, 1913, p. 377.

upper part, so that the gold overlay, or covering, might be fitted under it in order to make it more secure. In one tooth there is a very tiny ridge on the right side where the enamel was left in a beveled line. The teeth thus practically "face-crowned" are the four incisors and the two canines. ....". "In some of the cuts (as only the left lateral incisors contains an overlay), traces of a cement which aided in holding the gold fast to the teeth may still be seen". No decay, around the edges where the "overlays" were inserted, is seen on the surface of the dentine, showing the delicate and accurate work on the part of the operator, so as not to injure the dentine and cause premature decay.

Fig. 8.—Skull with filed teeth in upper and lower jaws, from Mound 6, Ruins of Labna, Yucatan. (In the Peabody Museum of Harvard University.)

In Mexico, human teeth that were filled and ornamented with stone, turquoise, and jadeite, have been found in prehistoric skulls, but Prof. Saville's "discovery" of gold *inlays* and *overlays* is said to be the first instances of ancient castings. In all cases, whether the fillings were of gold, stone, etc., the preparation indicated the use of tools. No tool has been discovered by which the work could have been done, and until the archeologist does, we can only admire the remarkable skillful work of the ancient dentists.

Filing of the teeth for personal ornamentation, it seems, was as common among the South American prehistoric man as among the aborigines of the Eastern continents.

A STUDY OF MOUTH CONDITIONS OF PATIENTS SUFFERING FROM STOMACH AND INTESTINAL DISTURBANCES.

By Blaine Truesdell, D.D.S., and W. H. Mick, M.D., Omaha, Neb.

BELIEVING that faulty or abnormal mouth conditions are more or less associated with gastro-intestinal disturbances, the writers were prompted to carry on rather extensive investigations. Many men of both the dental and medical professions, who have had a large clinical experience, have long recognized the inter-dependence between the condition of the oral cavity and the gastro-intestinal tract, and we trust none will question that thorough mastication is essential to good digestion. We are presenting this subject at this time as a study, and will give the findings of these patients, who seek medical advice, for digestive disturbances. We are not selecting patients to prove any particular point.

Unfortunately some of these patients are seen too late to relieve their difficulties. These patients were examined by X-ray method, and some of the conditions verified by operation or autopsy. Some of these patients were too weak to attempt to make models of the mouth and teeth. In nearly all cases, however, the bite was taken to determine the extent of impairment of mastication, if any existed. In many instances but comparatively few teeth have been lost, yet the dental apparatus as a whole has often been badly crippled by the loss of one or two teeth, so much so that thorough mastication was practically impossible. Some cases show all of the teeth present, but in malocclusion of a more or less severe nature. Naturally teeth that do not occlude normally with their antagonists are of but little or no value as organs of mastication.

In speaking to members of both professions, we find many otherwise competent and capable men—consider a patient having thirty-two sound teeth in his mouth—as fully capable of thorough mastication.

The dentist as a rule examines the teeth with the jaws open, while the medical man, if he examines the teeth at all, usually does so with the jaws closed, and very often his training has not been sufficient to cause him to notice an abnormal bite when he sees it. Neither of these examinations is complete. *The mouth should be examined both open and closed.*

The examination of the mouth and teeth in these case reports, was made with the sole object of determining the usefulness of the teeth, as organs of mastication, and where a variation from the normal or most effective occlusion existed, such abnormal condition was noted and a record made of the same. All absent teeth, that is teeth that had been lost through caries or otherwise were noted, and as nearly as could be determined, how long previous such teeth had been lost. An effort was also made to learn the approximate length of time the patient took to eat an ordinary meal. In some cases where the teeth were in normal or nearly normal occlusion, and where there was no good reason why the patient should not masticate the food, it was found these patients were very rapid eaters, and had been for several years, in fact they had virtually been bolting their food.

In order to determine the usefulness of the teeth, the bite was taken on

a sheet of ordinary yellow base plate wax, obtainable at any dental supply house. This is the quickest and most reliable method of learning whether the patient has the *ability* to masticate his food, for this member of the animal kingdom is not endowed with a gizzard as is the bird family. If the food is not masticated while still in the mouth the stomach must necessarily do more than its share in preparing the food for the use of the body.

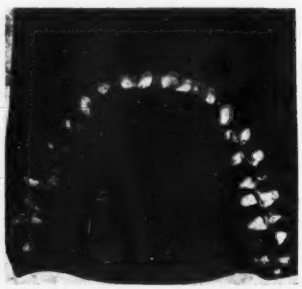

Fig. A.—Practically normal bite

Fig. B.—Malignant mass *M*, bismuth filling both upper and lower portions of stomach *B*.

The patient is instructed to close the teeth naturally, and of course he will bring his front teeth together in the most abnormal and uncomfortable position, but with perseverance he can usually be prevailed upon to close the back teeth on both sides at the same time. The patient is instructed to close in like manner when the wax is inserted into the mouth. Be sure that the patient keeps the mouth well open until the wax is carried back so as to

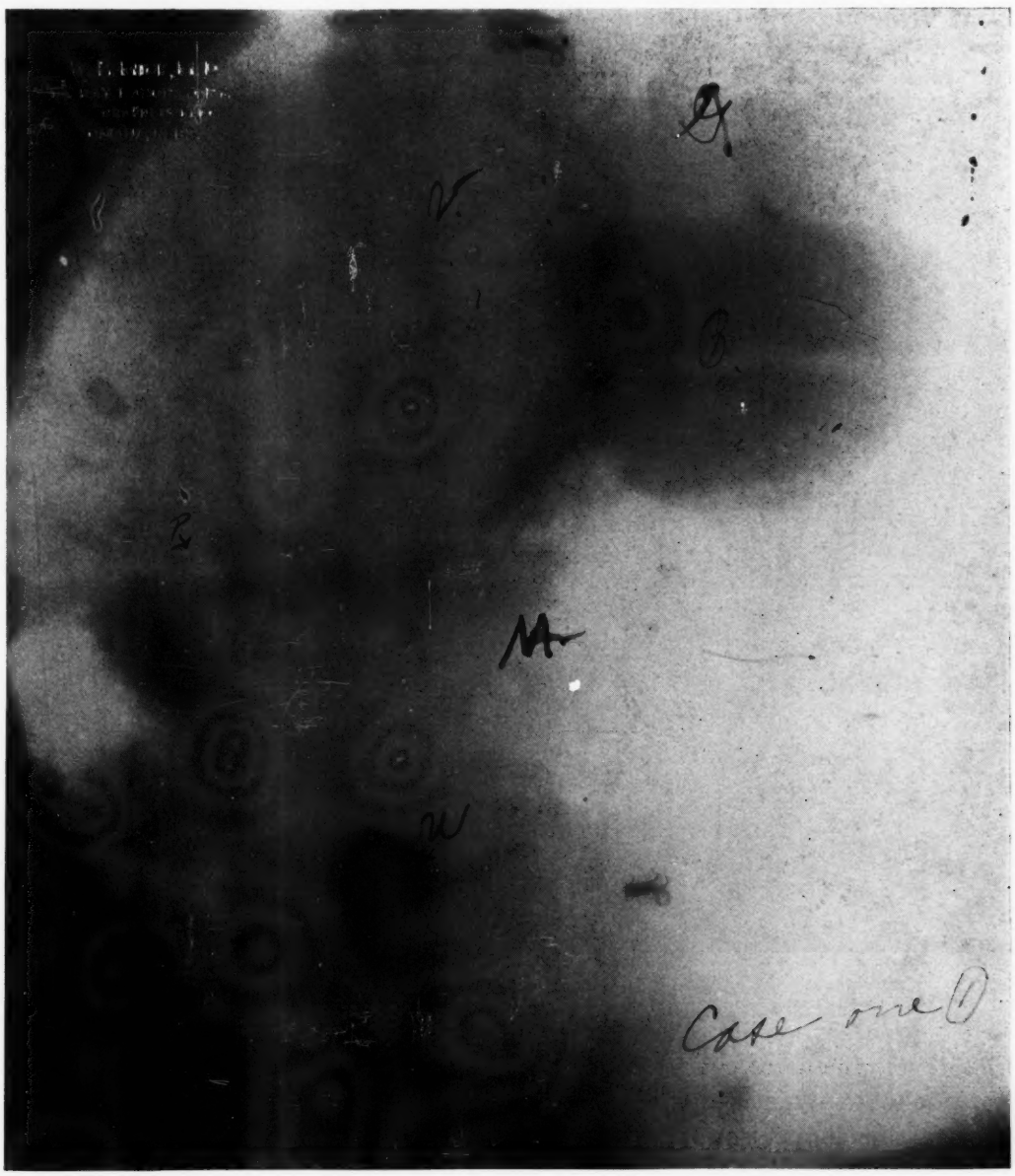

Fig. 1.—Malignant tumor *M*, gas bubble *G*, bismuth in stomach *B*, vertebrae *V*, pyloris *P*, dime placed over umbilicus *U*.

catch every tooth, then instruct the patient to close the back teeth firmly, holding the jaws closed for fully a minute without sliding the teeth on each other, then to open the mouth and carefully remove the wax. Comparing this bite with a normal bite (Fig. A) it is easy to determine the approximate effectiveness of the dental apparatus as a whole.

The mouth, the first portion of the digestive tract, is the only portion over which we have direct control in the process of digestion. The question is: How well and how long can the digestive organs handle food without proper and thorough mastication? Also how much trauma do the stomach and intestines receive from improperly digested food?

In our past clinical study of malignant conditions, about ninety per cent of superficial or skin cancers that came under our observation have given a history of trauma and some of those who gave a negative history may not have remembered an accident or injury that hapened years previous.

Fig. 2.—One hour after meal.

If one severe blow has anything to do with laying the foundation for the development of cancer, years after, what may constant mild trauma do to a delicate structure as is the lining of the stomach?

In this connection we beg to submit the following case reports:

*Case 1.**—Mrs. C. Oral examination showed patient had been wearing a full upper plate for a number of years. She had a few scattered teeth and roots left in the lower jaw, but her ability to properly masticate food was practically nil. X-ray examination revealed a large malignant growth occupying about one-half of the stomach. (Figs. 1, 2, 3 and 4.) The contents of the stomach emptied in about five hours. The growth was too large to remove surgically and gastro-enterostomy was thought inadvisable as long

*In Case 1 we are presenting a number of Radiographs, showing the breakfast during the process of leaving the stomach and filling the intestine.

as there was no complete obstruction. This patient lived about six weeks after the diagnosis was made. She died without knowing what the trouble was or even suspecting cancer. The remarkable thing about this patient was the severe nature of her trouble which had undoubtedly existed for some years and the small amount of evidence it gave of its presence. This woman gave a history of having had indigestion for thirty or thirty-five years, but not severe enough, in her judgment, to cause her to consult a physician until she began to fail in health. She grew weak rapidly and was referred by her physician for X-ray examination. While this case is out of

Fig. 3.—Two hours after meal.

the ordinary in severity, it is by no means without exceptions, as reports have come under the writers' observation of patients going about their usual work, until a very short time before they took sick and died of a rapid growing cancer of the stomach. Details as to whether they had had previous indigestion were not obtainable.

Case 2.—R. C., age 27, a physician and a son of a physician. This is one of the cases wherein a definite diagnosis has not been made and where the patient is still under observation. In the event of definite conclusions or a change in the condition of this patient, we will refer to Case 2 at some

future date, when we expect to present a further study on this subject. The history of this patient is very interesting.

Examination of the mouth showed the absence of both lower first molars and both upper canines which were lost early in life (Fig. 5). The loss of

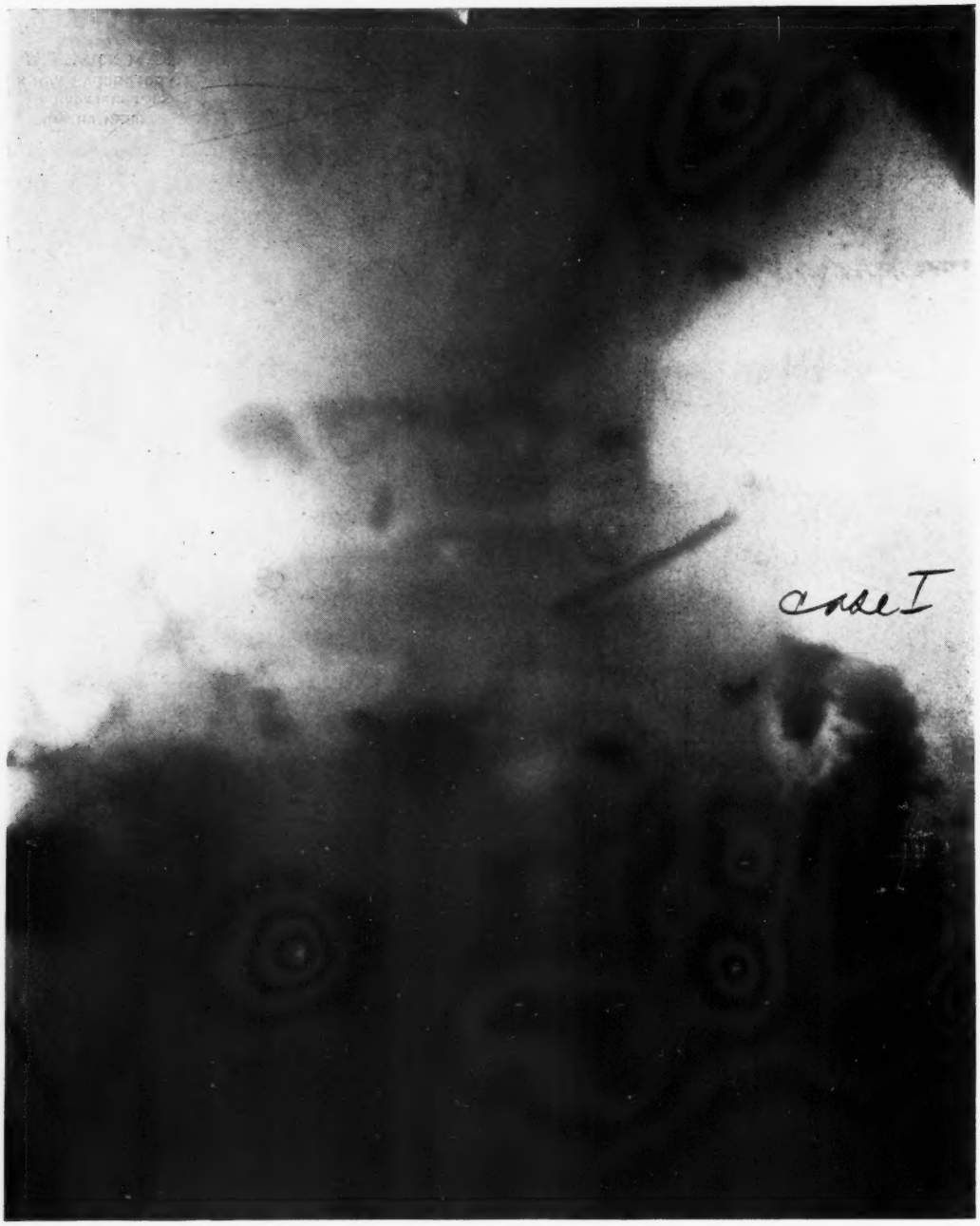

Fig. 4.—Three hours after meal.

these teeth has resulted in diminishing the effectiveness of his masticating apparatus fully fifty per cent, as is shown by the models of his teeth and wax bite (Fig. 6). Incidentally he is a very rapid eater, never taking more than fifteen minutes to eat a hearty meal. He was advised to have his

occlusion corrected and the missing teeth supplied by artificial dentures, which he has agreed to do.

This young doctor was referred for chest examination about one year ago, and was reported as having a normal chest, and the physician referring the case, informs us that clinically he was of the same opinion. His cough continued throughout the year and is worse at night. On re-examining his chest a few weeks ago, the magen blase, or gas bubble at the top of the stomach, showed through the diaphragm (Figs. 7 and 8), and was about the largest that ever came under the observation of the writers or from plates examined in other laboratories, not only in this country, but abroad.

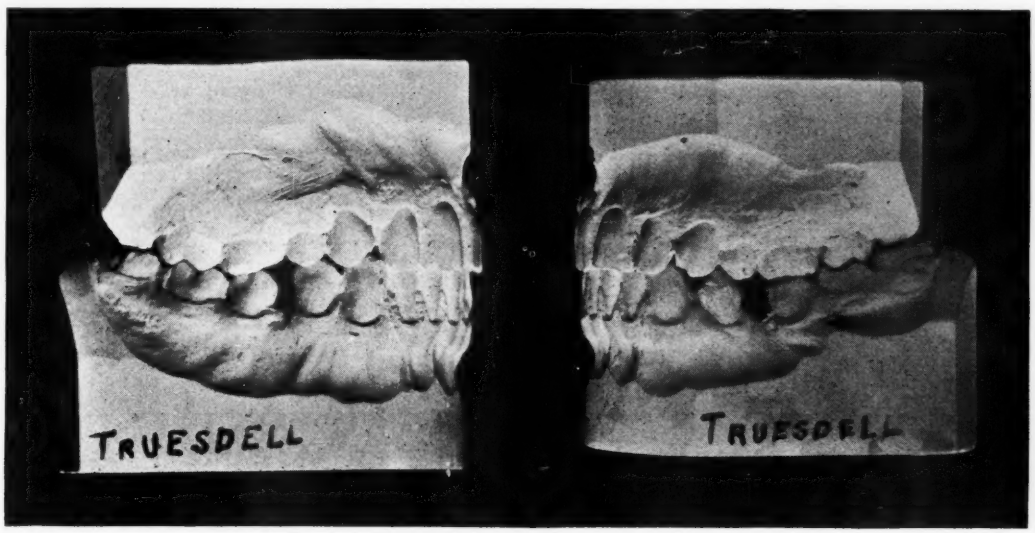

Fig. 5.

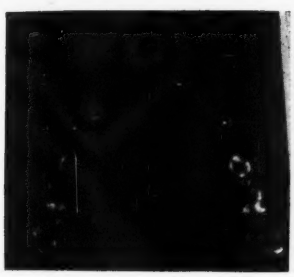

Fig. 6.

The chest is practically normal. A few days later he was given a bismuth breakfast, with the following findings: The stomach fills normally, is in normal position, and empties itself in a normal way, in fact outside of the large amount of gas, both when the stomach is empty or filled, you would say that there is no abnormality in the stomach, and the question would arise in your mind immediately: Is this man an air swallower? All the contents of the stomach passed through the small intestine very rapidly, after passing the pylorus, in fact abnormally fast. Within six hours after taking the bismuth meal, the entire amount was in the colon (Fig. 9), the advanced portion reaching past the medium line, in the transverse colon. In report-

ing on the stomach examination his physician says that he has never found any blood in the stools or anything that would suggest a stomach or intestinal pathology. The patient never vomits, has no pain, and says he can eat anything, never feels overfed and always eats in a hurry. He is nervous, coughs and is always hungry and has about fifty per cent of the normal masticating power.

Fig. 7.

Case 3.—Mr. O. A., age 55, farmer by occupation, began feeling bad in December, gradually became weak. The following March he had a burning sensation just under the ribs and could not keep food in his stomach at all. Since that time was constantly under the care of a physician. No one seemed able to check his vomiting. A large mass was appearing just under the ribs and he began having more and more difficulty in swallowing food. On the 13th of September, when he appeared for X-ray examination he was unable

to take even liquids into the stomach. He had been examined by a number of surgeons who refused to operate. In giving fluid bismuth the esophagus was found to contain bismuth, down to very near the diaphragm. From this point there was a narrowing and an irregular string-like appearance for some few inches before reaching the stomach. An effort was made for a few hours to get bismuth into the stomach, but it was found impossible. All

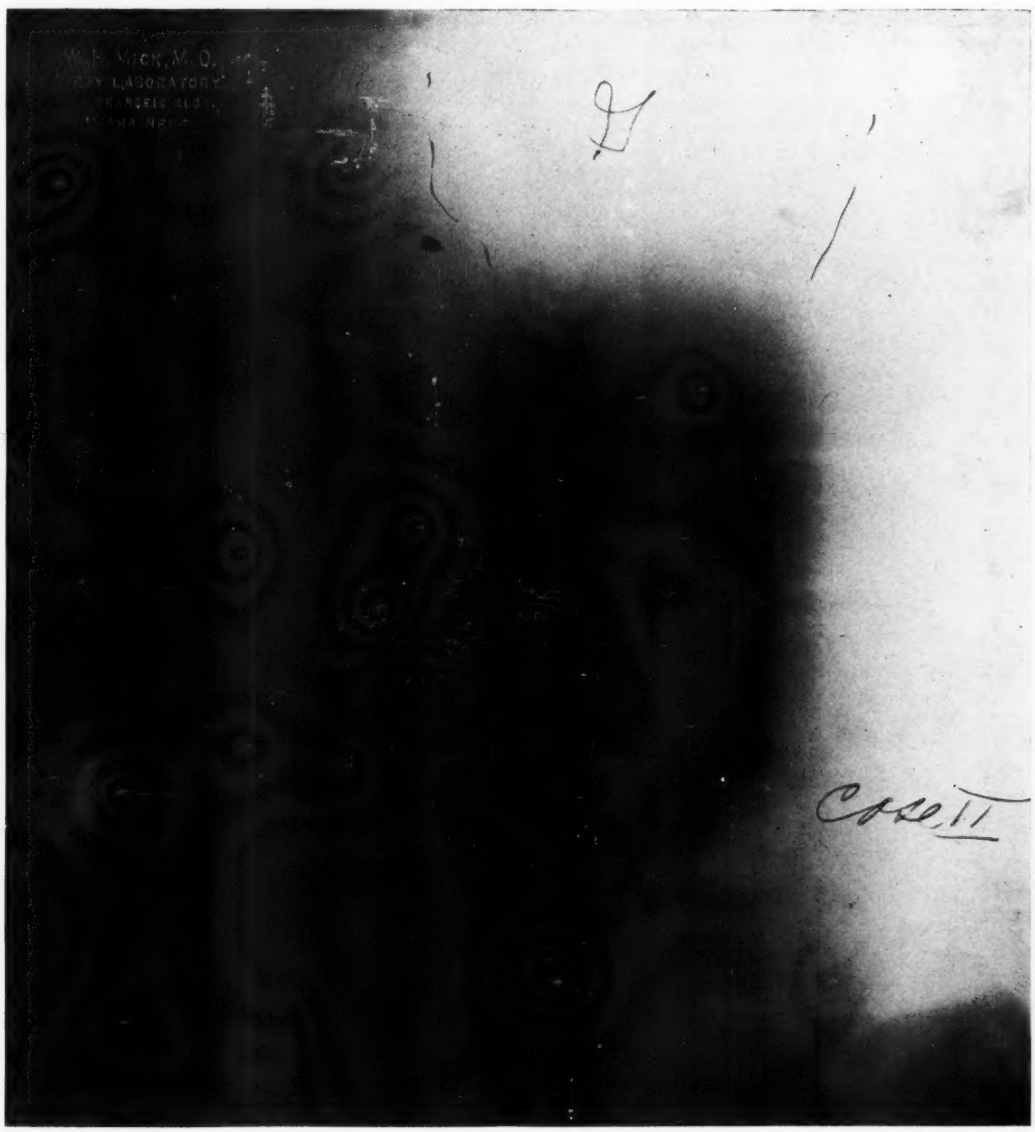

Fig. 8.

manner of means had been resorted to, to keep up his strength and nourishment. Artificial feeding was done with difficulty. He could not drink water, unless he had taken a small amount of wine, or other alcoholic stimulant. Prior to having difficulty in swallowing, this man was not addicted to the use of alcohol. Alcohol had been prescribed for its stimulating effect, and it did more than that, it contracted the tissues sufficient, for a short time, to allow a small amount of fluid to pass into the stomach (Fig. 10). In

this way we were able to get an idea of the course of the opening of the esophagus into the stomach, but not enough to give us any idea of the stomach itself. This man lived but a few weeks longer. There was no question about the diagnosis of carcinoma of the cardiac end of the stomach, and lower portion of the esophagus.

At eighteen years of age he said his teeth were all in bad shape and examination at the present time, at the age of 55, showed only the upper right first and second molars to be sound, while he had a number of badly decayed roots, both in the upper and lower jaws. It is worthy of note that

Fig. 9.

this patient lived thirty-seven years after his mouth and teeth became so bad that thorough mastication was out of the question before he died of the malignancy.

Case 4.—Miss M. Mc., age 17, had a tumor in the left lower portion of the abdomen with a history of having had a operation six months previous, was very weak, in fact had to be carried about. Diagnosis by the microscope after operation, showed the tumor to be sarcoma. The mass began to reoccur within a few weeks after operation, the tumor at this time was about the size of a person's head. It was impossible to inject bismuth into the colon. Bismuth meal showed the stomach to be normal as to size,

shape, and position (Fig. 11). X-ray examination twenty-four hours later showed the bismuth well in the lower end of the descending colon, as illustrated by X-ray picture (Fig. 12).

Oral examination showed the lower left second molar and lower right first molar badly decayed, and the upper left deciduous canine was still in place. Patient had an abnormal upper frenum labium. The bite in this

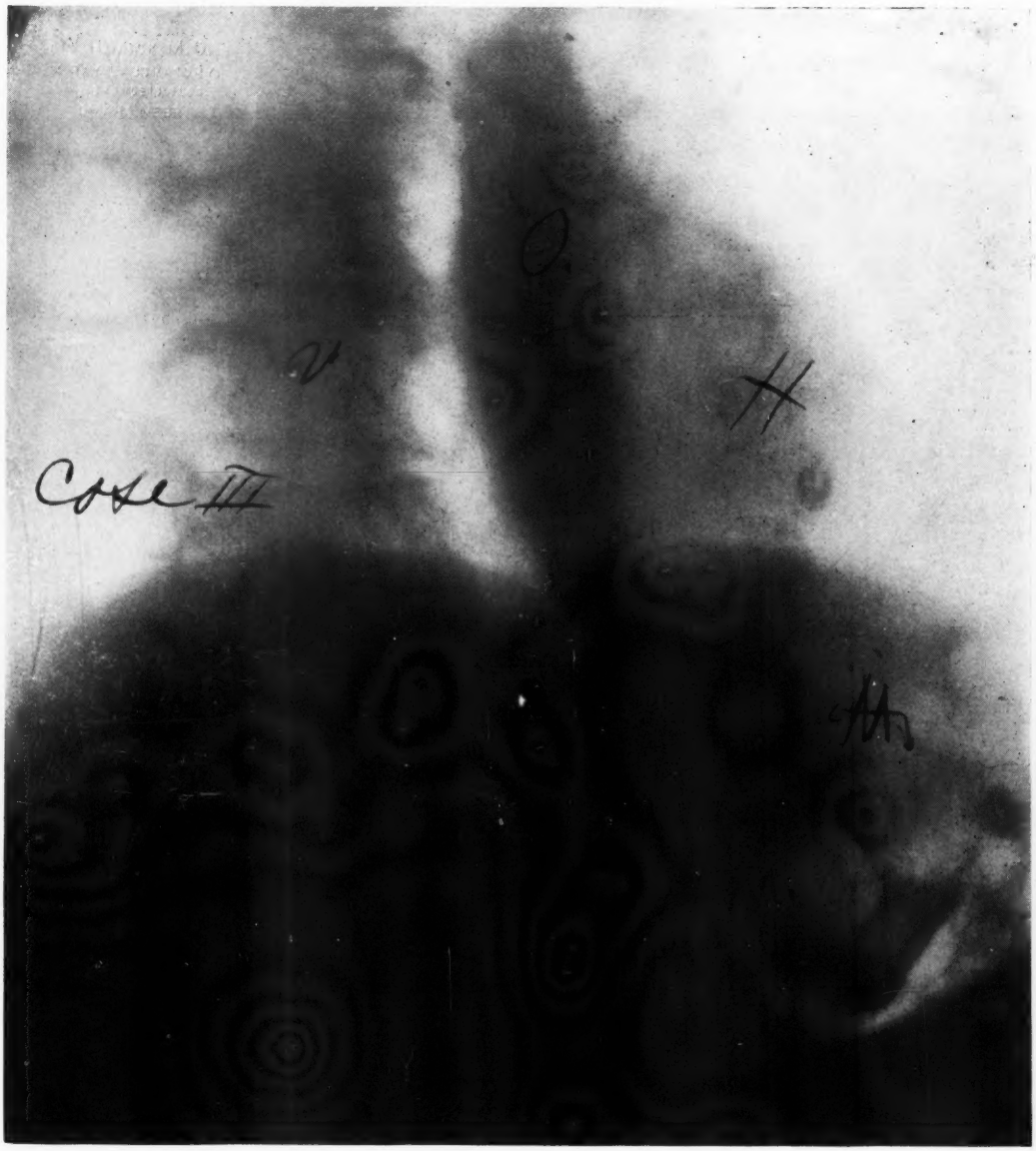

Fig. 10.—Malignant mass *M*, heart *H*, bismuth in esophagus *O*, vertebrae *V*. Notice the diaphragm and liver.

case was nearly normal, showing that thorough mastication was possible, so far as the teeth were concerned (Fig. 13). She was advised to have the mouth put in as good condition as possible by having such teeth as could not be saved, removed and artificial dentures substituted. This she is having done. The mass disappeared entirely under X-ray treatment, and the patient is able to do the heaviest kind of physical work at present, two years later.

Case 5.—Miss B., age 19, had tubercular glands in the neck at age of 14, removed surgically and treated by X-ray method for recurrence, after operation, also had appendix removed at age of 13. X-ray shows the chest normal at the present time. Complains of indigestion. X-ray examination shows dilated stomach with pylorotosis (Figs. 14 and 15). The small intestine and greater part of the stomach being in the pelvis.

This patient has a Class II, Division 1, malocclusion (Angle classification) as will be noted from the cuts of the teeth (Fig. 16). Her bite is very poor (Fig. 17), considering that all teeth except the third molars are

Fig. 11.

present, merely illustrating again that while all the teeth must be present, they must also be in normal occlusion in order to be of greatest usefulness to the individual in preparing the food, in the mouth for further digestion, as it passes into the stomach and intestines. About two years previous she began correction of malocclusion, but after wearing appliances half-heartedly for about a year, she gave up treatment altogether. Judging from her masticating powers, she will likely suffer the consequences in the course of the next ten to fifteen years.

Case 6.—Mrs. W., age 69, had had to be careful of what she ate for years, was weak and on treatment for arteriosclerosis. Blood pressure, 210. X-ray

examination showed the viscera practically all in the pelvis. She died of apoplexy six months later.

Oral findings: Patient had been wearing an upper plate for the past 33 years. She had lost the lower left second premolar and second and third molars, also the lower right first and third molars. The lower left second premolar and right first molar were replaced with bridges, but the occlusion of the plate and bridges and natural teeth below was very poor (Fig. 18). In fact so poor that the bite taken on a sheet of beeswax showed only an occasional hole where a cusp of a tooth happened to puncture the wax.

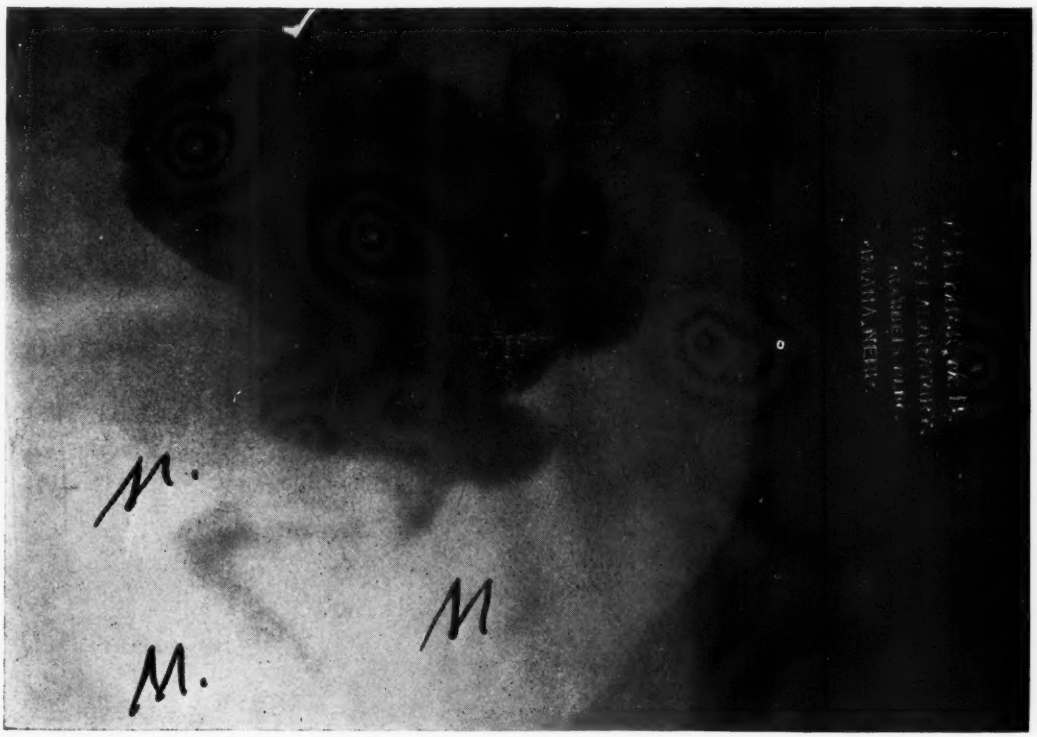

Fig. 12.

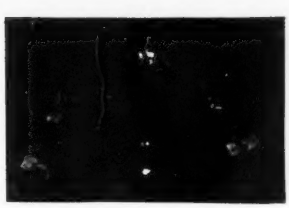

Fig. 13.—This wax bite became distorted before photograph was made, consequently the bite as shown does not do justice to the anterior teeth.

Case 7.—Miss J., age 40. This patient has been under the care of a physician for both headache and stomach trouble for years. Her occupation is such that she has but very little time to spare for her meals. She is very fond of coffee, and often uses it to excess. She has a great deal of pain and distress in the stomach at times. Has never vomited blood, nor had blood in the stools. X-ray examination showed a large dilated stomach with the pylorus resting in the pelvis. There is a large residue in the stomach

after six hours. The intestines in this case are practically all in the pelvis. Diagnosis of visceroptosis was made.

The condition of the mouth and teeth are graphically shown by the accompanying models (Fig. 19). The upper left first and third molars, the upper right second premolar, the lower right second and third molars and left second molar all had been lost. The lower left second premolar and

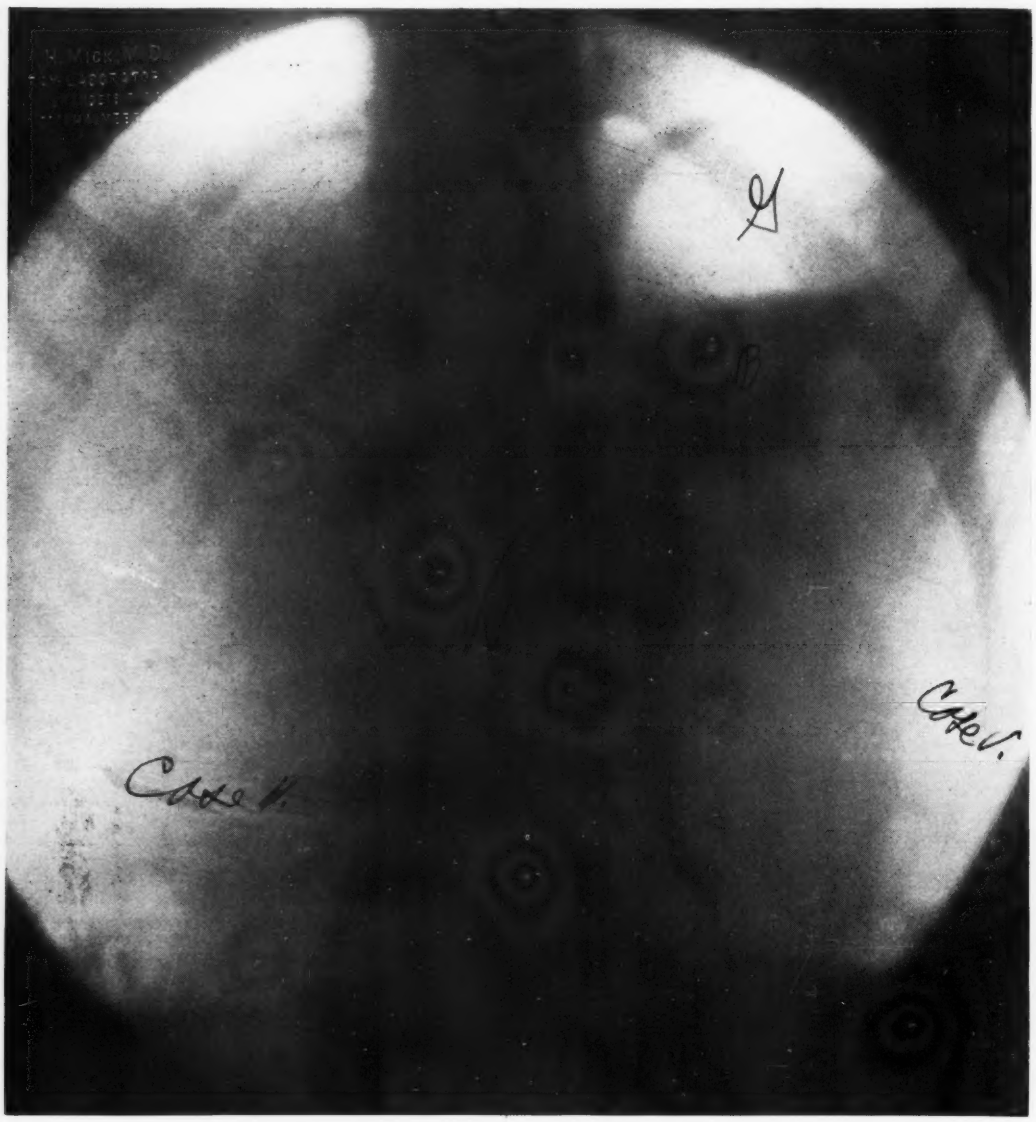

Fig. 14.—Taken while patient was eating her meal. Notice gas bubble *G*, part of meal *B* being held in upper portion of stomach for a time.

first molar had extensive caries. The masticating powers of the remaining teeth amounted to less than half of what a normal mouth would show (Fig. 20). She is having the mouth put in as good condition as possible, in order to increase her masticating powers and prevent further trouble in the future.

Case 8.—Miss P., age 12, daughter of a late physician. She has a nervous disposition and is a very rapid eater. The evening previous to making

the X-ray examination, she swallowed a piece of roast beef, about the size of a quarter (Fig. 21). She says it contained some of the outside of the roast which had been browned. This became lodged in the esophagus a little above the diaphragm. She has been unable to take food or drink for twenty-four hours. Diagnosis was made of esophageal spasm. She had experienced difficulty in swallowing before, when swallowing improperly masticated, or large mouthfuls of food.

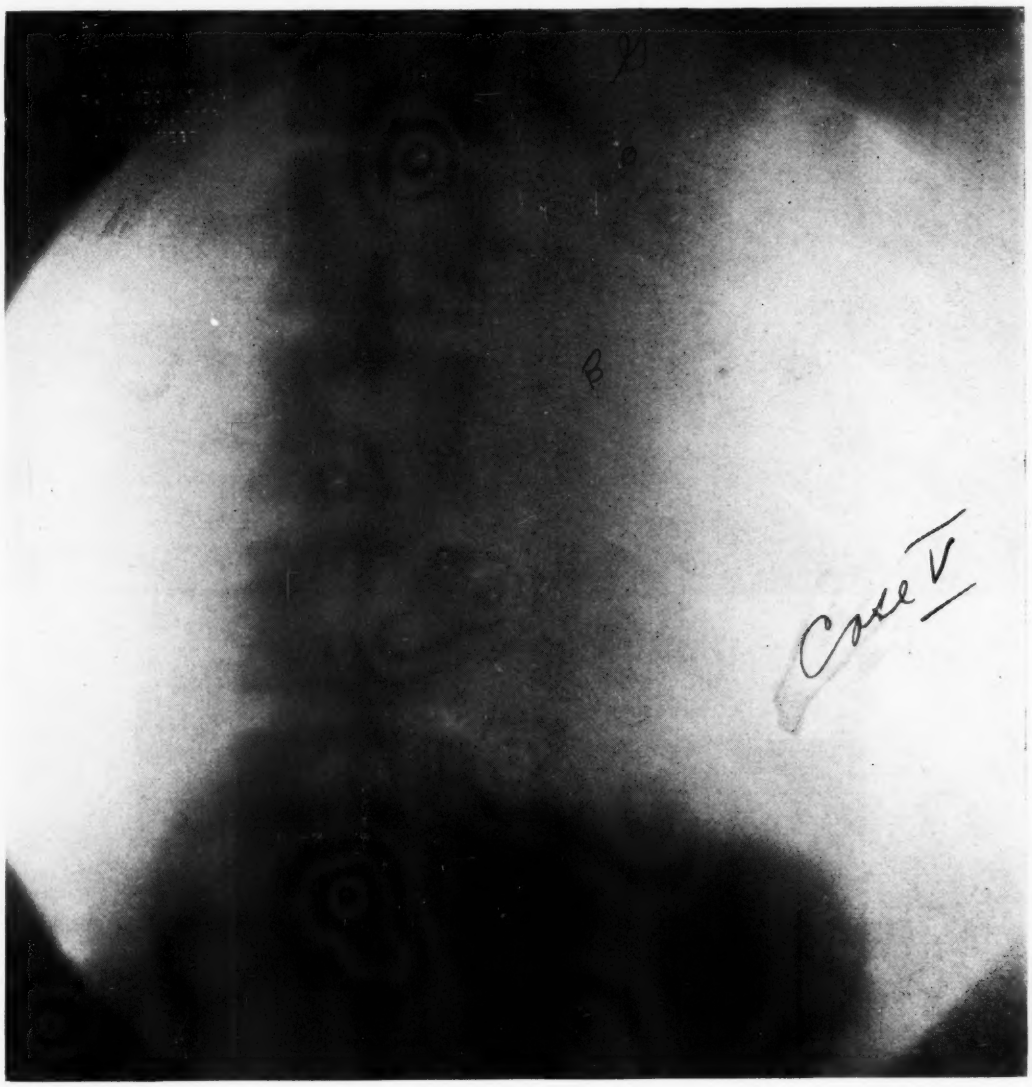

Fig. 15.—Taken immediately after the meal.

Her oral examination revealed all teeth from the first molars forward present and in normal occlusion, except the upper right canine and first premolar and lower right first premolar, which were not fully erupted, but erupting normal in position (Fig. 22). This patient has the natural powers of thorough mastication and her trouble is caused entirely by too rapid eating. The process of deglutition is a very interesting study when watched by the X-ray method, first by giving fluids, second by semi-solids, as mush, third,

solids as capsules, containing from one to five grams of bismuth sub-carbonate. These gelatine capsules, oval in shape, are specially prepared. These are used in patients complaining of difficulty in swallowing, where differential diagnosis of esophageal stricture, spasm, or tumor must be made. This is done by giving fluid or mush which will often be retained at any portion of the esophagus, more especially if esophageal spasm is present. Small pills and often small capsules are retained at any portion of the esophagus, more especially if esophageal spasm is present. Small pills and often small capsules are retained, but by giving large five gram capsules all the substance retained in the esophagus gravitates readily into the stomach. By repeating

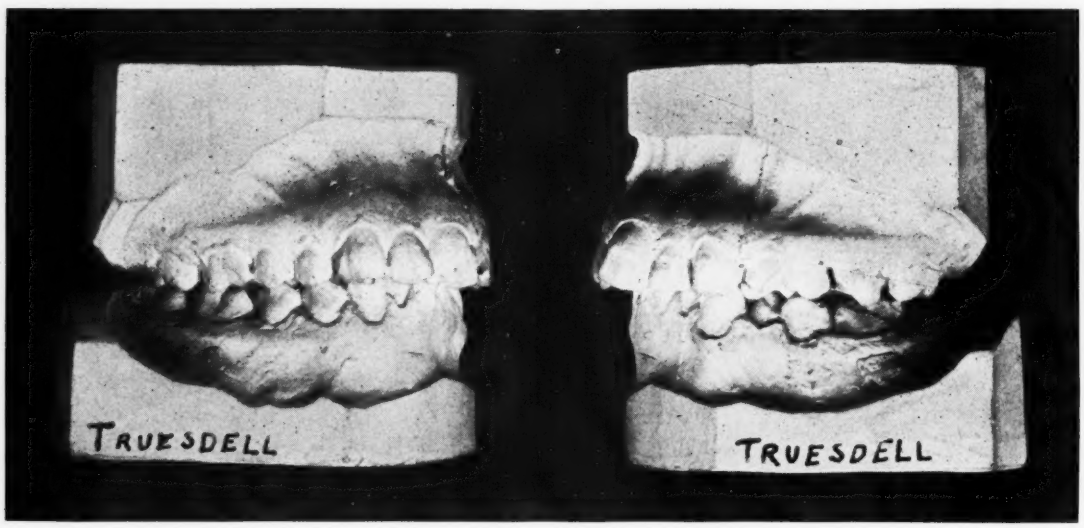

Fig. 16.

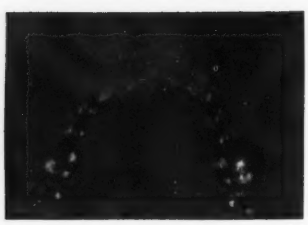

Fig. 17.

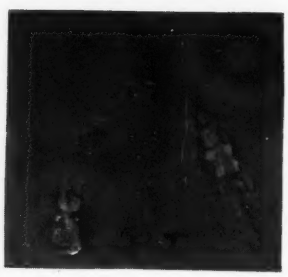

Fig. 18.

the large capsules it will be noticed that they are not retained in the esophagus, which proves the absence of stricture. In stricture you invariably have a funnel-shaped outline of fluid bismuth or mush, and this is found constant at the same place, by repeated examinations, whereas esophageal spasm is not always at the same place. Tumor gives the appearance of a hand with an index finger (Fig. 10). The fluid or semi-solid passing down with an irregular outline below and the small or constricting portion below passing to one side giving it the appearance of an index finger. This picture found in tumor is entirely different from the funnel-shaped appearance, which is caused by dilation of the esophagus above the stricture. Patients who complain of difficulty in swallowing, can be fed dry bread, toast, or meat,

which is not properly masticated, and this followed by bismuth will demonstrate the presence of esophageal spasm.

In this connection it is interesting to note the following case:

Case 9.—Mrs. L., age 36, who gives the following history: Was eating chicken, when she swallowed a piece of gristle, which felt to her as if it was lodged in the esophagus low down in the chest. Had not been able to eat or drink for eight days. This patient was very weak, and had to be hurried to the hospital after making X-ray examination, consequently the bite and complete mouth examination were not obtainable; however, her teeth were not in very good occlusion, and she has had similar trouble ever since she

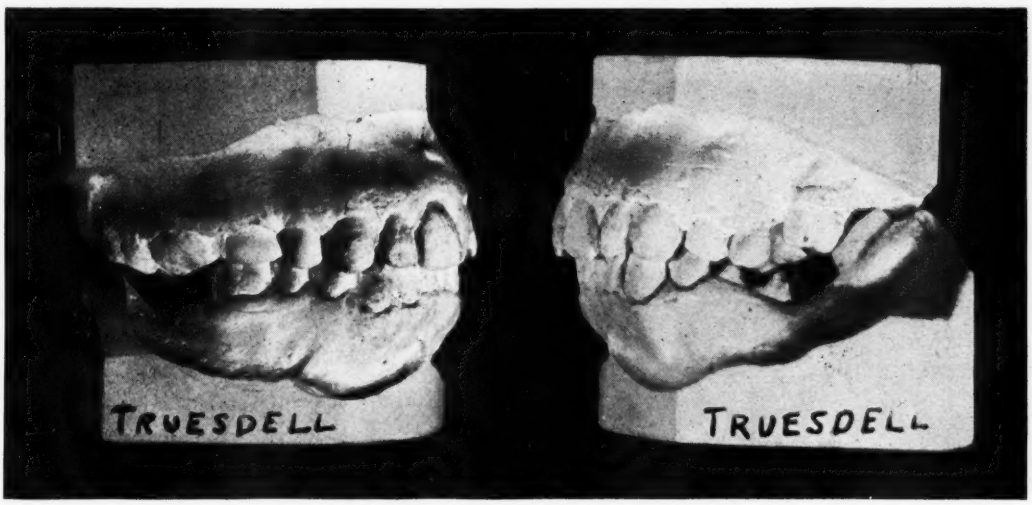

Fig. 19.

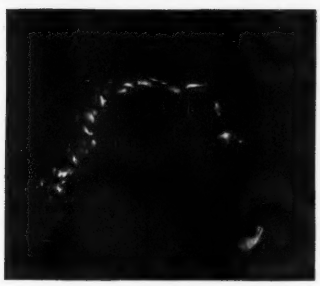

Fig. 20.

was a child. Fifteen years prior she was unable to eat or drink for a period of three days. The present spasm was just above the diaphragm. When given sedatives, and orthoform for a few days, she had no further difficulty for three or four months, when she passed out of our observation, in fact she went home to a distant city a few days after examination, and our information after that time was received by letter.

Case 10.—Mr. G., age 70, complained of stomach trouble for sometime which became severe a year previous and caused his health to fail rapidly the last five or six months. He had a great deal of pain and vomiting, lost considerable blood, was weak and under-weight. He had a typical cancer cachexia. X-ray examination revealed a well-developed carcinoma of the

pyloric end of the stomach, also carcinoma of the esophagus about three inches above the diaphragm.

Mouth examination showed the following teeth had been lost from time to time: the upper right first, second, and third molars, upper left first and third molars, lower right second and third molars. Upper right canine was badly decayed. All remaining teeth were badly eroded but firmly implanted.

Fig. 21.—Lateral view showing mush in the esophagus just anterior to the vertebrae and above the foreign body *F*, heart *H*.

He had chewed tobacco since he was about twenty years of age. He had considerable salivary calculus. Before losing so many teeth his occlusion was probably normal. Through the advice of friends he went to the sea-coast in an effort to recover his health. He died about six months later.

Case 11.—Mr. W., age 49, ex-railroad man, complained of stomach trouble for about eighteen or twenty years. Began with gradual vomiting

attacks which became more frequent, often vomiting blood, attacks lasting from twenty-four to forty-eight hours. Has not vomited a great deal the past three years. He suffers pain and soreness and erupts sour contents of the stomach. X-ray examination showed an incisura of the greater curvature of the stomach and residue in the stomach after six hours. Diagnosis made of gastric ulcer of the lesser curvature of the stomach. Mouth examination showed the loss of the following teeth: the upper left second and third molars, upper right first and third molars and lower left first molar. Upper right second molar devitalized and filled, lower right third molar badly decayed and aching. All his other teeth are sound. His teeth have low cusps and he has an end-to-end occlusion. His occlusion is shown in the accompanying cut of the waxbite of his mouth (Fig. 23). This patient began railroad work at twenty-six years of age, and continued for nineteen years, during which time he necessarily was a very rapid eater and according to his own story practically bolted his food. So far as his teeth were concerned, he could have performed quite efficient mastication until very recently. He took X-ray treatments as an experiment for about ten weeks, and left materially improved, feeling better and gaining in weight, but we have lost track of him since that time.

Fig. 22.

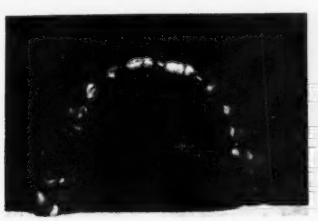

Fig. 23.

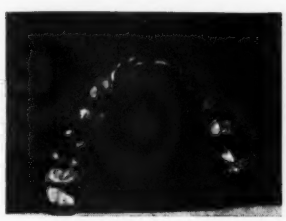

Fig. 24.

Case 12.—Miss S., age 37, complained of stomach trouble for years, accompanied by pain and vomiting, etc. X-ray examination gave evidence of calloused ulcer in the lesser curvature of the stomach. Mouth examination showed a large bridge extending from the upper right canine to the right second molar, either the upper left first or second premolar was lost and the other premolar carried a gold shell crown. The lower left second premolar, lower right first premolar and first and second molars all had gold shell crowns. The lower right third molar had been lost. The occlusion of the crowns and bridges was very poor (Fig. 24). Her teeth had been bad for about twenty years. She had been a slow eater for a year previous to examination, but a rapid eater for about thirteen years before that. She was advised to have her mouth and teeth put in the best condition possible for masticating purposes, but one year later had had nothing done in this respect. This patient is under constant observation and we will report this case later if any changes occur. She took X-ray treatments, about fifty-five in number, as an experiment. She has had comparatively little trouble since then and reported that she had gained twenty pounds the following four months and was able to work every day.

In the near future we hope to present a further study of this subject, after which we will sum up our case reports, classifying our conclusions.

THE LOOP REGULATING APPLIANCE.*

By Martin Dewey, D.D.S., M.D., Kansas City, Mo.
Professor of Dental Anatomy and Orthodontia, Kansas City Dental College;
President of The Dewey School of Orthodontia.

IN presenting this paper on what I have termed the *Loop Regulating Appliance*, I am not claiming anything new, but simply giving the description of a regulating appliance which I have been using for several months with a great deal of satisfaction and which I think I will continue to use more and more in my practice in the future. I have used the term *Loop Regulating Appliance* because one of the principal features of this device is the employment of a loop which exerts force by being opened. The appliance is made of some spring material and the loop acts as a spring. By opening or closing the loop one is able to increase or decrease the size of the arch, for the appliance is used in the nature of an arch or alignment wire, thereby eliminating entirely the use of the screw used on standard forms of expansion arches or alignment wires.

The question of the superiority of the screw force over the spring force has long been a question of dispute, and we find some of our leading practitioners advocating the use of the screw force in preference to everything else, and still others who are equally positive in the use of the spring force only. It is my belief that there are indications for both the screw force and the spring force and there are certain conditions in which the screw force is much better than the spring force, and *vice versa*.

Fig. 1 shows a very simple case of malocclusion, which is characterized by the arches being in normal mesio-distal relation—the only malocclusion present at this time is the left upper central which is in lingual occlusion. In treating this case, plain bands were put on the second deciduous molar with the seam made on the mesio-buccal angle of the molar; a perpendicular tube was soldered on the molar band about the region of the buccal groove. These tubes are made from 18-gauge tubes soldered perpendicular with the tooth, which makes stationary anchorage on the molars as far as antero-posterior or bucco-lingual movements are concerned. A piece of 18-gauge non-corrosive wire was selected and a short spur was soldered on the end of the wire to engage the tube on the molar band. The distal end of the horizontal wire was bent around to form the loop shown in Fig. 2, which shows the appliance laying on the model. A locking device similar to this has been described at various times by Young and is known as the *Young Locking Device*, designed for use with the pin and tube appliance. The ease with which this locking device can be made recommends it to me over any other similar form. Fig. 2 shows a side view of the model before treatment, the appliance laying on top of the model. You will observe that there are two loops in the alignment wire which were made with the loop-forming pliers designed by Federspiel. The loops are put in the arch for the purpose of increasing the spring or increasing the length of the lateral half of the alignment wire,

*Read before the Alumni Society of The Dewey School of Orthodontia, Kansas City, Mo., February, 1915.

so as to carry the incisors forward. The incisor now ooccupies its proper position, and I will show you the finished result of this case at some future time.

Fig. 3 shows another case of malocclusion which we would classify as neutroclusion or Class I, as there is a normal mesio-distal (or antero-posterior) relation of the arches. The left side of the case, illustrated in Fig. 3, shows that there is an impacted lower second premolar which was erupting far to the lingual, as there was not sufficient room between the first premolar

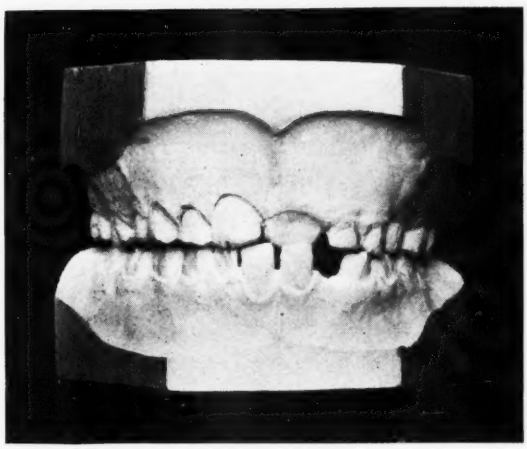

Fig. 1.

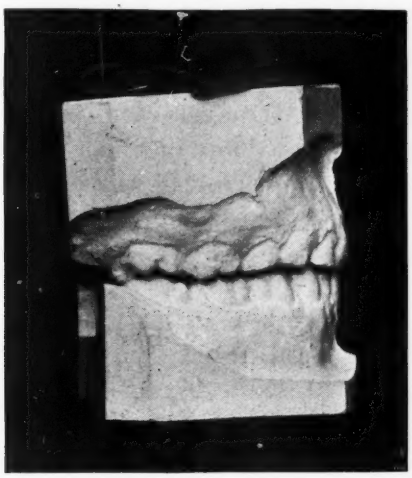

Fig. 2.

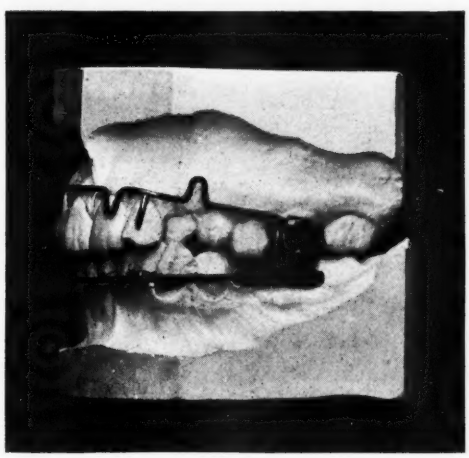

Fig. 3.

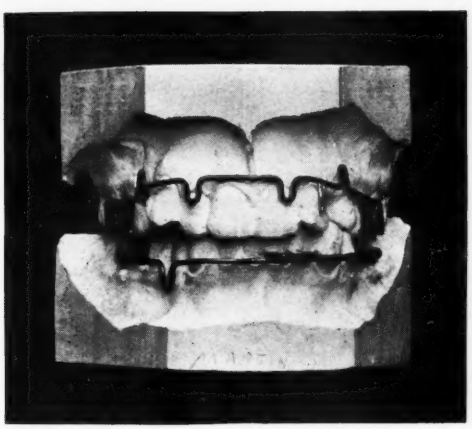

Fig. 4.

and first molar for it to erupt in its proper position. The upper left canine is in lingual occlusion, while the upper left lateral is protruding with the crown to the labial and the apex of the root lingually, which necessitates the moving of the cutting edge of the tooth lingually and the apex of the crown forward. You will observe that on the upper first molars we have plain bands, which show the position of the perpendicular tube and the ends of the alignment wire bent around to form the locking device. By springing the gingival portion of the distal end of the wire away from the band, we

are able to move the arch down, thereby disengaging the spur from the tube and removing the appliance. There are two loops on the upper arch, one of which is made in the region of the canine and premolar and the other in the region of the central incisor. These loops can be turned either gingivally or occlusally according to the indication. In this case you will notice the loop in the region of the canine and premolar has been turned gingivally so as to get it out of the way as much as possible. The one in the incisor region, which should be made between the region of the central and lateral, has been turned gingivally so as to exert a force parallel with the incisors, or, in other words, to act the same as a spur which you see in the region of the lateral incisor. By opening the loop in the premolar and canine region, we increase the length of the arch from the incisors to the molars the same as if we turned the nut on a threaded expansion arch. By opening the loop in the incisor region, we increase the expansion of the arch in the region of the canine and serve the same purpose as the double arch which was designed with a screw in the incisor region for widening the two lateral halves; and do it more easily. The purpose of the spur which

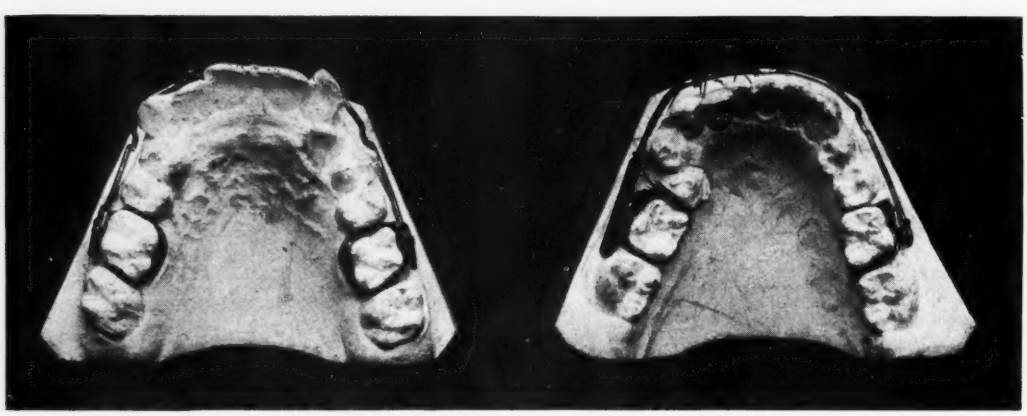

Fig. 5.

is seen in the region of the lateral incisor, is to move the apex of the root forward and the cutting edge distally, which is accomplished by placing a ligature around the alignment arch at the gingival portion of the tooth and bending the tip of the spur on the incisal edge of the spur lingually. This exerts a lingual force on the incisal edge and a forward force on the apex. The lower appliance, which you see in Fig. 3, is one-half of the expansion arch, which is used in the usual manner. A horizontal tube is soldered to a plain band on the lower molar and a spur is soldered on the expansion arch in front of the canine, and a long loop ligature is used to carry the premolar and canine forward, as shown in Fig. 4. The ligatures which you see on this case are smaller than should be used but were employed for descriptive purposes only, so as to avoid mutilating the model by putting on large wire ligatures. The lower appliance consists of a combination of the regular expansion arch and the loop appliance. The band on the lower left first molar carries a parallel tube while the one on the lower right molar carries a perpendicular tube.

You will also notice that the loop on the lower appliance on the right side is turned gingivally, which is the best manner of turning the loop in the lower arch, because if the cusps are long, the upper teeth very often strike the lower loop. Care must also be taken in soldering the perpendicular tube on the lower molar band (as shown on the right side) in such a position that the occlusion of the upper molar will not strike the occlusal portion of the locking device. That means that the tube on the lower molar must be made shorter than the tube on the upper molar so they will not interfere with the occlusion of the teeth. It is needless to say that in using these perpendicular tubes on the molars, when moving the molars buccally, they will move in an upright position if the alignment wire does not twist upon itself, which often occurs when too much expansion force is put on these teeth. One nice feature about this appliance is the use of the plain molar bands which you see in the accompanying illustrations—they are much more kindly to the tongue than the use of clamp bands. However it must be remembered when using the plain bands, that the bands stay in position only because of the adhesive property of the cement and will not stand as

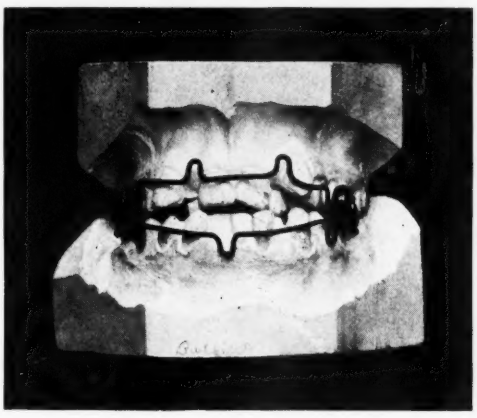

Fig. 6.

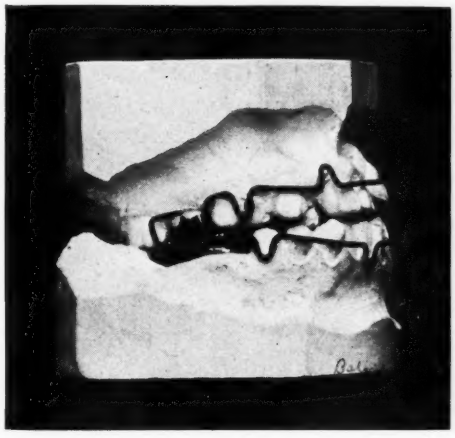

Fig. 7.

much force, without loosening, as the clamp band. One of the strong features in favor of the loop appliance is that it is almost impossible with an 18-gauge wire to exert too much force, especially in a patient as old as the one the models of whose teeth are shown in Figs. 3, 4 and 5. By looking at the occlusal view of the upper model you will see that the right upper lateral occupies a very peculiar position and the canine is in lingual occlusion. When I put this loop appliance on this case, I very much doubted whether small gauge wire would exert enough force to move the upper canine over the lower teeth. At the present time, (February, 1915), the canine is over the lower teeth, and the case is very nearly completed. The premolar region is expanded nicely, the right canine was depressed as it should have been and the laterals and centrals were moved to their proper positions. The left side of the lower arch which had to be lengthened was lengthened by using a half of a regular expansion arch as described elsewhere in this paper; the occlusal view shows a soft soldered spur on the expansion arch with the ligature in place to carry the canine and premolar forward. The cut does

not show any ligature around the premolar, but the ligature should extend around both the left first premolar and canine, and space made so that the second premolar can be moved into position.

Fig. 7 shows a front view of another case. The patient is about 22 years old, the teeth are very badly bunched, and a general expansion is required in both the upper and lower arch. The occlusal view shows that one lower second molar and one lower first molar are missing, and these missing teeth will have to be taken care of later. In regard to the treatment of conditions such as you see in the lower case, I believe sometimes it is preferable to attempt to move the second and third molars anterior and close the space rather than to put in an artificial substitute. I have treated cases both ways but at the present time do not believe that either plan would be suitable for all cases and that by using judgment we can decide which plan is the most desirable to use. However, this paper is not intended as a discussion upon the treatment of mutilated cases but on the use of the Loop Appliance, which in the author's practice has proven extremely satisfactory. In examining Figs. 6 and 7, you will see that plain bands were placed on the upper molars,

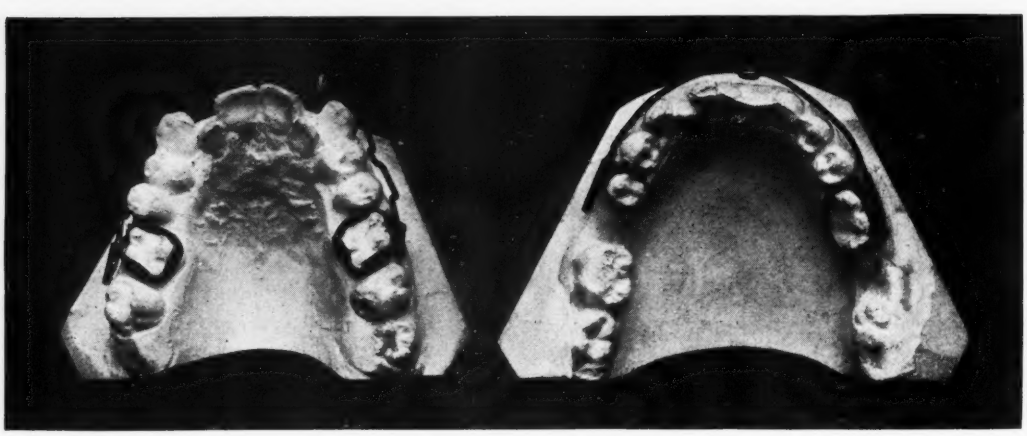

Fig. 8.

on the lower right molar and left second premolar. The bands on the upper molars carry perpendicular tubes, while the lower bands carry parallel tubes. The parallel tubes are used on the lower molars because the teeth are short; by using perpendicular tubes the occlusion would interfere with the locking device.

By looking at the right side of the upper model, you will see that the spur has been soldered on the wire, then the wire bent gingivally to bring it in the region of the gingival portion of the second premolar, then a loop bent occlusally to occupy the position between the two premolars. This loop in this position serves a purpose of two spurs and moves the premolars bodily, for resting against these teeth as it does, it prevents them from tipping. By using the wide portion of the loop-forming pliers, which forms a wide loop, a loop can be made of sufficient width so the perpendicular portion of the loop will occupy the greatest convexity of both the first and second premolar, thereby moving them bodily and overcoming any tendency they might have to rotate. Very often we find that the ligatures

on the premolars have a tendency to slip gingivally. This can be avoided by a soft soldered spur placed on the perpendicular portion of the loop as you see on that part of the loop which occupies the first premolar region in Fig. 7. The loop in the premolar region, by being open, will again perform the function which is performed by the screw, while the loop in the incisor region will carry the canines apart and expand the arches. You will notice that the loops in the incisor region have both bands turned gingivally, for appearance's sake, as the patient possesses a short lip, and objected to the appliances showing any more than absolutely necessary. The construction of the lower device differs from the upper in that we have the parallel tube, therefore the loop in the premolar region is made directly in front of the tube so the posterior portion of the loop will rest against the end of the tube, performing the same function that the nut performs in the regular expansion arch. One loop has been placed in the central region in the lower appliance, because the expansion of the lower arch is not as great as that required in the upper. In opening these loops it requires considerable experience in order to open the loop and not misplace the arch. In bending or opening the loop in the posterion portion, we must make an equal opening on the anterior portion to keep the arch straight. The ease with which these appliances can be constructed has been very satisfactory to me, for I can make an entire loop appliance out of a plain piece of wire and put it in the mouth in the same length of time that it takes to adjust a manufactured expansion arch. These loops are very comfortable to the patient and this form of appliance is less annoying, and less conspicuous than the old large size expansion arch with a nut, which irritates the lip. At the present time I have confined this appliance to the treatment of Class I (neutroclusion) cases and cannot say that it would be superior to the regular expansion arch in anterior or posterior occlusions of the lower arch. It is my intention to report later in the columns of this journal as to the finished results of the cases herein presented and at the same time give descriptions of other cases which are being treated at the present time in my clinic. But my present belief is that the loop appliance will greatly supplant any other form of appliance in my practice.

MODERN ORTHODONTIA IN PRINCIPLE AND PRACTICE.*

By W. O. Talbot, D.D.S., Fort Worth, Texas.

MODERN orthodontia is that branch of dental science which has for its object the establishment of normal occlusion of the permanent set of teeth. The early practice of orthodontia was devoted to the correction of irregularity of the teeth with little or no regard for correct occlusion. To Edward H. Angle, more than any other man, is due the credit for the change of principle. To E. A. Bogue is also due the credit of teaching and practicing the prevention of irregularities of the permanent teeth by the expansion of the arches of the temporary teeth.

There are two great principles that control the practice of orthodontia. The first is to establish *function* of the teeth; the second is to establish *harmony* in the facial lines. The primary function of the teeth is mastication of food, and this can best be performed when the teeth are in normal occlusion, so the ideal in every case of orthodontia should be to establish the most perfect occlusion possible. To do this correctly one must study the plaster casts of a case until he has pictured in his mind the shape, size, and relative position of the arches and the exact position of each tooth in its relation to every other tooth in both arches.

All malpositions and disproportions must be compared with the normal in order to determine the extent of the abnormality. To do this is to diagnose the case. To tell or to write the diagnosis of a case of malocclusion is to classify it. The only classification in orthodontia that will ever stand and be universally accepted must be based on the relation of the jaws, the dental arches, and the position of the individual teeth. Orthodontia is based on occlusion, therefore its classification of malocclusion must be in accordance with occlusal relations.

The classification of Angle is the only one so far in use that is founded on this system. He divides all cases into three great classes. Those with a normal mesio-distal relation of the arches he calls Class I. Those with a distal relation of the lower arch he calls Class II, and divides the Class into Divisions 1 and 2, with a subdivision each for the unilateral cases in each division. Those with a mesial relation he calls Class III, and makes a subdivision of this in unilateral cases. This is the best that has been done and all praise and honor should be given for the advances, and yet it is open to criticism because malocclusion is a deformity and as such should have a name that indicates the deformity. Lischer has offered a classification based on the malformation of the jaws, malrelation of the dental arches, and malposition of the teeth which is an improvement, in some respects, over the Angle classification, though it is not perfect. Other writers have offered classifications based on dento-facial relations and have numbered the classes, but these have not been accepted by the profession. Some writers have divided irregularities into groups or divisions according to the tooth move-

*Read before the Texas State Dental Association, at Ft. Worth, April, 1914.

ment required for correction. Such grouping is not a classification in any sense, for most cases would belong to several classes at the same time.

In order to diagnose a case correctly, as a rule, the following procedure should be gone through. At the first sitting the case should be examined and the parent, or guardian, who accompanies the child on the first few visits should be informed of the nature and requirements of orthodontia treatment in the presence of the child, unless he or she is familiar with such work. The parent should also be advised of the usual expense of such work, but with few exceptions, no price should be made for a given case until the casts of the case have been studied. Consultation fees should be charged when casts are made, a diagnosis made, price of treatment given, and the work is not done. If there are deposits of tartar, the teeth should be scaled and polished before impressions are taken. In all cases the impressions should be taken in plaster. Have the trays deep enough to carry the plaster well around the alveolus so as to show the position and direction of the roots of the teeth and the thickness of the process. Plaster casts should be made from the impressions and carved as usual in nice regular form.

If there are delayed unerupted teeth, with no indications of their presence, and particularly if the space is partly closed up, skiagraphs should be made to determine positively their absence or presence and the location. If there is much facial deformity, as in distal or mesial occlusion cases or in open-bite and excessive over-lap cases with lip displacement, the front and profile photos should be made and kept as a record of the case, likewise this should be done when such cases are completed. In some cases it is difficult to determine just how much an arch varies from the normal—whether too wide or to narrow for the size of the teeth and the jaws. This part of the diagnosis has been greatly simplified by the use of the celluloid charts and instrument devised by C. A. Hawley, by the use of which the central, lateral, and cuspid may be measured and the average size and shape of that arch determined. The use of this chart is not absolute in all cases out it is a good average and should be in use by every man who practices brthodontia.

It has long been a mooted question among certain prominent writers as to whether one arch of teeth was too far mesial or the other too far distal, or whether both arches were abnormal in relation to the contour of the profile. In Angle's Class II and Class III cases this point frequently has to be decided in order to make a correct diagnosis. A correct occlusion is determined by the normal cusp locking, but facial harmony is the anatomical balance of the features in profile in which the three artist's divisions of the face—the upper, the middle and the lower thirds, are in correct relation each with the other two, according to type. To determine this relation is the work of an artist, to correct the mal-relation is art itself. No mathematical rule absolutely controls art, but there are well recognized proportions in the human anatomy, and particularly in the face, that constitute beauty. It is said that in a correct Greek type of face a perpendicular line will touch the brow, pass through the middle of the wing of the nose, through the lower part of the upper lip and touch the lower lip and chin. This rule does not apply to the Roman type of face.

After making a great many tests, the writer has found that the following

rule of harmony will apply in most cases of both types and to their combinations; viz., taking the anterior border of the external meatus of the ear, which is one of the earliest calcifications and constant points of the head, as the center of the circle: the tip of the chin, the tip of the nose and the middle of the forehead should be in the circumference, also that the incisal edges of the upper centrals and the bridge of the nose between the eyes should be in the circumference of a circle with the same center. These measurements can be taken of the face with a compass prepared for the purpose. When a diagnosis has been made, it should be written out in full and a record made of every and each variation from the normal. This should be kept for frequent reference in conjunction with the original casts, photos, and skiagraphs.

The next step is the mental process of seeing the teeth of a given case moved about in the jaws, the arches of teeth expanded or contracted, the teeth extruded or retruded, rotated, or the relation of the arches shifted until all the teeth assume their correct relation in their respective arch, and the arches stand in correct relation to each other and the facial lines are harmonized. This is the process which reverses the abnormality, and is necessary in order to plan the correct treatment. It enables one to decide what appliances should be used, how they should be set, and how the force should be applied to produce the required movement, and what anchorage should be secured to withstand the pressure.

In planning treatment one should never forget that he is shaping, making, and remodeling human anatomy, that he is dealing with living tissue.

In considering the appliance to be used every form of appliance, every alteration, and every retainer should be planned and a record made of it before treatment begins. When a case is once thoroughly mastered and definite plans laid and recorded for the treatment, the case will require but little further study.

The next point to consider is the time required to correct a case, and the time the retainers should be worn. This can only be determined by the experience of the operator, and others who have handled similar cases of like age and with similar appliances, but an approximation should be made and recorded. The case may take a few months or a few years, but the patients want to know, and should know.

The next step in the process is to fix a fee for the work and the terms of payment. This should be agreed upon and recorded and a payment secured before treatment is begun. This clause may seem out of place in a scientific paper, but it is a science that few dentists put into practice, and this is where it belongs—just before the work begins. If it is not considered here it will be the first time you say money, and if you happen to be able to wait until the case is finished to say it, nine times out of ten you will take less than your time and services are worth, or make an everlasting enemy of the patient and perhaps both. If a dentist is undecided as to the exact charge to make, he should name a maximum and a minimum fee. These things should be put into a contract form and signed, or at least agreed to by the parties financially responsible.

Treatment in orthodontia consists principally in tooth movement by the application of force to the crowns of the teeth, by the use of appliances

to move them into arch alignment and correct occlusal relations. In open bite cases and in Class III cases, the force may be appllied to the chin. Anchorage for the application of this force is in the teeth of the same arch, teeth of the opposite arch, and the occipital anchorage supplied by the use of the head gear. Tooth movement takes place by tipping, in which the crown moves further than the apex of the root and vica versa, and by bodily movement in which the crown and the root move in parallel lines. These comprise the four movements of mesial, distal, buccal, and lingual. In addition there is rotation, elongation and depression in which all parts of the tooth move alike.

Nearly all cases of irregularity require some expansion, most of which is needed in the anterior part of the arch. It is often difficult to determine the best appliance to use in a given case as so to get the best results in the shortest time and under the conditions affecting the handling of the case. The basic appliance in Orthodontia work requiring the expansion is the "Expansion Arch" or 'Arch Bar", which may be modified into many forms and used with many attachments to great advantage.

Every orthodontist owes it to himself and to his patients to study carefully the merits of the various forms and qualities of the material of which appliances are made. The best way to study appliances and materials is by using them. The greatest advance in orthodontia appliances in recent years has been in the new Angle appliances for moving the anterior teeth bodily.

Another valuable modification of the arch is the use of a finger spring soldered to the arch and allowed to rest on the labial surfaces of the anterior teeth to prevent tipping, or the use of a U-shaped wire attached to the arch and resting across the anterior teeth for the same purpose.

Then comes a most valuable modification known as the loop attachment which is an oval pin soldered to each end of the arch wire and resting in a tube soldered to the molar band parallel to the long axis of the tooth. The pin is held in place by a loop spring soldered to the arch. By the use of this attachment in conjunction with Angle's new pins and tubes on the bicuspids and the anterior teeth, the entire arch may be expanded by moving the teeth bodily, while each tooth is under control to be moved more or less as desired. This has never been possible before with any appliances. The greatest objection to this appliance is the necessity of banding each tooth to which it is applied. Retainers may be constructed on this plan to great advantage.

EXCERPTS

A New Method in Dento-facial Orthopedia.—"We have an inadequate method for making exact diagnosis of malocclusion"—so says J. A. W. Van Loon, M.D., D.D.S., Utrecht, Holland (*Dental Cosmos*, Sept., 1915). Van Loon describes a method of diagnosis which he maintains is directed on new and more correct lines. In order to reproduce the physiognomy we take a photograph or a plaster facial cast, which does not, according to Van Loon, succeed in reproducing the relation of the teeth to the face in a state of repose.

Angle's Views on the Trimming of Casts.—Angle differentiates on the plaster model an anatomical portion, consisting of teeth and gums, from an "art" portion to which a certain symmetriacl form is given by trimming according to a method worked out for him by Dr. Martin Dewey. This method of trimming has an esthetic but no scientific basis. In my opinion Angle's contention is open to serious doubt, viz, that "It may be put down as quite a general rule that the degree of perfection of the models he makes is indicative of the knowledge, skill, and success of the orthodontist in the treatment of his patients." A collection of such well-trimmed models does certainly give an appearance of care taken by the orthodontist, but one cannot get a clear idea of the degree of knowledge, skill and success in the treatment from the appearance of a collection of models in which a scientific foundation is lacking.

The reason why, according to Angle, this trimming is to be done, is as follows: "There is a principle governing the proportions of the trimmed portion of the model that is very simple and natural, and gives fine balance and artistic effect." The manner in which such a model is trimmed I suppose to be generally known.

When the model is finished in accordance with this method, the base and top should be parallel. With *what* they must run parallel, Angle does not explain. If one regards the illustrations of models in Angle's standard work, one sees that the top and base of the model are made parallel with the plane of occlusion, whether the case belongs to class I, II, or III.

Northcroft's Views Regarding the Trimming of Casts.—In Bennett's great work one finds this clearly stated: "The casts should be trimmed so that the base of each is parallel to the plane of occlusion." One also finds data in relation hereto by Northcroft. He makes use of a tripod covered with rubber pads to avoid injuring the model; then he places the model with the teeth upside down on the tripod in such a way that only the two molars (or, in case the remaining teeth are not present, the two deciduous molars) and the central incisors touch the rubber pads; then, around the base of the model a line is drawn at a certain distance by means of a tracing-tool, and by means of a plane the base is trimmed along this line. Others place the lower model on a horizontal glass plate so that to the left and right one molar, and in front one incisor, touch the glass plate; then with a tracing-tool a line is drawn around the base of the lower model at a certain distance from the glass plate, and along this line the base is planed off. The lower model is now placed on its base, and the upper is set in exact occlusion relation on the lower model; then, with the tracing-tool, at a certain distance from the glass plate a line is drawn around the upper model, which is shaved off along this line. In this way the base and top run parallel with each other. It is clear that by all of these methods some points of the plane of occlusion indicate the direction of base and top of the model. The back of the model, according to Angle's method, must stand perpendicularly to the top and base. We do not find, however, any reference by Angle to the direction in which this rear plane must stand perpendicularly to the upper and lower plane.

Northcroft says: "After the base is made smooth, the model is placed on a wooden board or plank, and the back trimmed at a right angle with the median line." Others cut this back plane perpendicularly to the top and base, but following a line that runs parallel to the distal surfaces of the last teeth in the arch

(left and right) regardless that this plane stands perpendicularly to the median plane. The direction of the back plane is then indicated by the distal surfaces of the teeth, just as the occlusal plane indicates the direction of the upper and lower planes.

Shortcomings of Angle's Method of Model Trimming.—The sides of the model, according to Angle, must again stand perpendicularly to the top and base of the model; here the direction is plainly given, viz, parallel to the line of occlusion as indicated by the first molar and the canine. If, however, we observe the outline of his figures of base and top of the model, then these appear to be symmetrical—that is to say, both sides form like angles with the back. This is only possible when the teeth are entirely symmetrical, but in most dentures, especially in cases of malocclusion, the lines of occlusion to right and left do not form like angles with the mdian line. It is impossible, if one follows Angle's rule, to obtain a symmetrical figure. If one trims the sides to left and right parallel to the ine of occlusion, it is impossible to obtain a symmetrical figure. The line of occlusion of the teeth indicates, by Angle's method, the direction of the sides.

The front plane of the upper model consists of two equal planes that stand perpendicularly to the top of the model and meet at an angle, whether or not this angle comes between the two first incisors. Angle also says that, "Following this plan, any variation from the median line is shown."

The various planes of a model, trimmed in accordance with Angle's method, can never be used as a basis of judgment in respect to the deviations that present themselves in a set of teeth. Deviations in the line of the level of the teeth in the front and back part of the upper or lower jaws cannot be judged by the top and base of the model. Migrations of the teeth from left and right to mesial or distal in relation to each other, and in relation to a frontal plane of the skull, cannot be judged by the rear plane of the model. Migrations also in transverse direction in relation to the median line cannot be judged by the side planes. The angle of meeting of both front planes of the upper model cannot be looked on as a basis for judgment as regards migrations of the incisors in relation to the median line, if the back plane does not stand perpendicularly to the median plane, and yet the outline of the upper model is still a symmetrical figure. Thus the teeth can never be judged by the planes of the model, since it is the teeth themselves which indicate the direction of the planes. By my method, which will be described later, the model is so shaped that the planes form an exact basis for judgment in relation to the various deviations of the teeth.

The technique of imparting to the models a symmetrical form in accordance with Angle's method has been extensively worked out by various authors. For this purpose we have Angle's plaster plane, Grunberg's plaster plane, and a similar instrument introduced by Northcroft.

"A model trimmed in the foregoing manner has a very good appearance but it has no scientific value. Though it is true that we make our diagnosis for a great part by means of the plaster model, the first requirement is that the model should furnish a correct reproduction of the condition of the teeth as found in the case in hand. It will be clear to the specialist that the main question is not the relation of the teeth of the upper and lower arches to each other, but far more the relation of the teeth to the remaining part of the skull and the facial lines. The model trimmed according to Angle's method very insufficiently reproduces the true condition as it exists in the patient's case. Only the orthodontist who has taken into consideration merely the relation of the teeth to each other can be satisfied with such a model. It is clear that such a model can be given any position; one can turn it around a vertical, a sagittal, and a frontal axis—numberless positions are possible, while the orthodontist can not learn from the model what is the actual position of the teeth in the patient's mouth.

Critique of Angle's Classification.—If such a model be placed with its base resting on a horizontal glass plate, then any turning of the model around a frontal and sagittal axis is excluded; it is only possible to turn it around a vertical axis. The plane of occlusion which we are to judge is entirely governed by the direction of the base of the model. From this the great mistake of this method appears, namely, that this occlusal plane, from

which we are to examine the deviations in direction itself governs the direction of the basis for our judgment—that is, the top and base of the model. On the same faulty basis has Angle built his classification, in which the malocclusions are divided according to the relative positions of the first molars, into classes I, II, and III. Hereby also, points of the teeth—*i.e.* the first molars, which can themselves deviate in many ways from their normal position, are taken as a basis for judgment of deviations of position in the whole set. This classification is nothing but a diagnosis of relation of the first molars to each other in sagittal direction, and certainly not a diagnosis of an occlusal anomaly of the whole set of teeth. This has heretofore been all too little comprehended. Even in a facial plaster cast the same difficulties prevail as in the model; for neither can this facial cast be held in every position which—for instance, in judging the degree of prognathism—is of great importance.

Korbitz's Method of Diagnosing Malocclusion.—After this critical review of the value of the plaster model trimmed in accordance with Angle's method, I shall now consider the method of examination used by Alfred Korbitz—namely, the comparison of symmetry whereby it is possible to show the migration of the teeth from left and right of the arch in a sagittal direction in relation to each other and in relation to a frontal plane of the skull. To him belongs the merit of having introduced in 1909 this method of diagnosing malocclusions. He founds his method on the following basis:

Symmetry is one of the most reliable qualities of those organisms which possess symmetry, and every one makes unconscious use thereof when he critically regards an upper jaw—as, for instance, in trimming the upper model. In order to judge a model of an upper jaw, Korbitz makes use of the raphe that divides the upper jaw into two equal parts, which can hereby serve as a basis of judgment of the teeth from left and right. This raphe he indicates with a pencil line on the upper model; it is a curved line arising through the intersection of the median plane of the skull with the palate. In the lower model we have not such an anatomical line of intersection of the median plane with the floor of the mouth; therefore such a line must be constructed.

In order to construct such a line he places the lower upon the upper model in correct occlusion, and then drops a weighted thread from above down on the back of the model from the median line of the upper model. When now this model is held in the hand and turned in such a way that the perpendicular line—looking from behind into the model—coincides with the line of the raphe, then the plane which passes through the thread and the median line of the upper model represents also, while the models are held horizontally, the plane that intersects the lower model in the middle. On the back of the lower model, where the thread crosses it, a mark is made, and this point is joined with the foremost point of the median line of the upper model; this line of junction is the median line of the lower arch. This line will lie normally between the lower central incisors; if it meets an incisor on the lingual surface there is a migration of the incisors of the lower arch either to left or right. Then one constructs transverse lines on both models standing at right angles on the given median line and compares in that way the relative position of homologous teeth, left and right. In case both sides of the set of teeth are normal, homologous points of homologous teeth are touched by the same transverse line. If they do not, then the teeth have migrated from left to right toward the mesial or distal.

Korbitz points out that deviations of the entire arch or jaws are not demonstrable in this way. For that purpose it is necessary to have points external to the mouth that can be regarded as fixed—such as Angle assumes to possess in his "line of harmony," and Case in his "unchangeable area."

Now, when the model is turned so that the perpendicular line of the plummet is seen in line with the raphe, then it is certain, inasmuch as the raphe presents a curved line, that the model takes such a position in space that the median plane of the model stands perpendicular on the horizontal plane somewhere in space. One can thus (although Korbitz does not apply this practically) observe, by holding a model in this position, whether the level of the left, and right sides of the model is the same, or whether they differ in height; in other words, one observes asymmetry of the arch with the alveolar

process in a frontal plane in regard to a horizontal plane.

This asymmetry should be easily seen in the top of the model really represented the horozontal plane, but this is not the case with the present method of trimming. When revolution around a sagittal axis is excluded, when the raphe and the plummet cover each other, it is possible to turn the model around a frontal axis in all directions, as hereby the raphe and perpendicular line cover one another. Korbitz adds, in explanation of his method, "while the model is held horizontally." But how is that to be done when the model is held in the hand? Korbitz has trimmed the top of the model beforehand, as I understand it, in accordance with the method before described, *i.e.* parallel with the plane of occlusion. Only if the so constructed top should accidently stand perpendiuclar on the median plane of the model is it possible to hold this model, *i.e.* the top, horizontal while at the same time the perpendicular line and the raphe cover each other? If such a model is held horizontally, which requires a spirit-level, even then the condition is not reproduced as met with in the patient. While we are now able to judge the level of the teeth in a sagittal plane in relation to the horizontal plane (top of the model), it does not represent the patient's condition. In most cases, however, the top of the model indicated by the occlusal plane will not stand perpendicularly on the median plane, and it will not be possible to hold this upper plane horizontally while at the same time the perpendicular line and raphe cover each other. If in such a case the perpendicular line and raphe cover each other, then it will be seen that the upper plane does not run horizontally.

The top of the model should be made horizontal while the model is held in this position, and this should be possible at every turn of the model around a frontal axis, as hereby the perpendicular line, and the raphe are in line. The direction of the top of the model can be constructed just as one desires. Whenever the model is set on the table it does not reproduce the position which the patient's teeth have, neither in the frontal nor in the sagittal plane, because the median plane does not now stand perpendicularly on the horizontal plane; while, if the model is moved freely in the hand so that the perpendicular line and the raphe are in line, the median plane will stand exactly perpendicular on the horizontal plane—and in that position only can symmetry in the frontal plane in relation to the horizontal be judged.

After the line of intersection of the median plane with the upper model and the lower model has been indicated, the different transverse lines which are necessary for comparison of the symmetry must be constructed. For thls, also, Korbitz has pointed out for us a simple way. He takes a small oblong piece of white cardboard and draws a perpendicular line on it so as to divide its surface lengthwise into two parts. In the middle of the card a circle is cut out so that the line (part of the said perpendicular line) forming the diameter of the cirlcle drops out. When one now puts this card on the model and turns it so that the pencile median line on the model runs exactly in line with the remaining two parts of the perpendicular line on the card—which is observed through the circular hole in the card—then the longer side of the card will form a transverse line that stands perpendicularly on the median line. In that way one can move the card over the model and compare the various points to the left and right.

The Value of Symmetroscopes.—As Korbitz by this method intends only to find the median line of the lower model, his method is a very good one, but the tracing of the median line on the lower model is difficult to do, as it is a curved line. My remarks concerning the top of the model have been made solely in order to point out the importance of the top, and to make clear the difference between the method adopted by Korbitz and that followed with the symmetroscope. The more recently introduced instruments for indicating the median line and for making a comparison of symmetry have been all founded on the Korbitz method. Thus Zielinsky's orthometer, Grunberg's symmetroscope, Zawidzki's apparatus, and Shelldon Friel's symmetroscope. In all these symmetroscopes, the ground plane whereon the model with its upper plane is placed stands horizontally. Over this basal plane a thread is stretched that stands perpendicularly in the middle of the long side of the basal plane. With this thread, the dissecting line of the

meidan plane with the upper model (raphe) and with the lower model must now be brought into line; then a movable thread, that stands perpendicularly on the first thread, reproduces the transverse lines for the comparison of symmetry.

The great difference between other symmetroscopes and that of Korbitz consists in that the model is not now freely held in space, but that with its top it rests on the horizontal basal plane of the symmetroscope, and thus revolution of the model around a vertical axis is possible, while it is not possible around a sagittal or frontal axis. As the raphe is a curved line, *i.e.* the line of intersection of the median plane with the palate, if the optic axis from the eye is fixed in the median plane of the symmetroscope, the thread of the symmetroscope can only come in line with the raphe if the top of the model stands perpendicularly on the median plane—thus in one position only. If, as we generally do, we place under the symmetroscope a model the top of which is determined by the plane of occlusion, then it is never possible, if the axia of the eye lies in the median plane of the symmetroscope, for the raphe to come in line with the thread. This coming into line can only occur if the optic axis lies in a plane that forms an oblique angle with the bassal plane of the symmetroscope. The raphe of the model, as well as the observing eye, will be found beside the median thread of the symmetroscope. By the Korbitz method the median plane is found and placed vertically to the horizontal plane, so that deviations can be judged in the frontal plane in relation to the horizontal plane, but not the deviations in the sagittal plane. By means of the symmetroscopes the median plane is found, but is not placed vertically, so that hereby neither the deviations in the frontal nor in the sagittal plane, in respect to the horizontal plane, can be told. The symmetroscopes, therefore, are inferior to the Korbitz method.

If one has so placed the model under the symmetroscope that the thread falls in line with the raphe, then one can discover, by moving the transverse thread, whether there are migrations of the teeth from left to right in a sagittal plane in relation to each other, or in relation to a frontal plane of the skull. This frontal plan can be the rear of the model, at least if this stands perpendicuarly on the median plane in relation to the rear plane the degree of displacement in a sagittal plane can be read off. To read off the degree of displacement from left to right in a frontal plane in relation to the median line, the symmetroscope can only be made use of if the thread of the symmetroscope covers the raphe while the optic axis of the eye falls in the median plane of the symmetroscope; in other words, if the upper plane of the model stands perpendicularly on the median plane, one moves the third sort of thread attached to the symmetroscope, which forms a different angle with the median thread, and thus reads off the degree of the angle in which the threads to left and right from homologous points run off. By the present mode of construction of the top of the model, measurement with the symmetroscope is without value, inasmuch as the raphe of the model always lies beside the median thread of the symmetroscope. Grunberg, in his method of examination, does not first allow the median thread to run in a line with the raphe, but lays the thread between the first two incisors (these may often deviate from the median line) and lays two lines along the sides of the arch of the teeth at homologus points which go off at a tangent of like degree, and then judges the arch. This seems to me a very faulty method.

The Writer's Method.—Symmetroscopes have been invented in order to make a comparison of symmetry; that is, in order to trace the median line and to draw the transverse line. For this purpose they are very well suited. As exact instruments for measuring, however, they cannot be used. For this reason I have endeavored to construct a symmetroscope wherewith one might also exactly read off the degree of the various displacements of the teeth. After having pointed out the incompleteness of the methods of examination referred to, we will now describe a method that, according to my idea, will be in many respects more exact than those hitherto employed.

In this method we have tried to attain the following aims: The model is to reproduce the deviations in all directions precisely as they appear in the patient; also, deviations in different patients can be compared with each other, so that all can be judged upon the same basis.

It is clear that as a basis of judgment, it is not points of the teeth themselves that must be determined, but external points. For this purpose the median plane serves together with its perpendicular frontal and horizontal plane. One can thus suppose each set of teeth to be put in a cube with horizontally placed basal plane, the set of teeth being so placed that the median plane of the upper model, of which the raphe is the dissecting line, runs parallel with the side planes of the cube. Deviations of the teeth and jaws can then be judged in relation to the planes of the cube. The cube is supposed to be placed not only around the teeth but aslo around the patient's head; the head can take any position in the cube, and, with the head, the teeth in occlusion. It is essential, if we wish to compare the various teeth of different patients, to give the head of each patient precisely the same position in the cube.

In this position of the head in relation to the planes of the cube, the teeth can be judged, and moreover we have always the same basis for judgment. To attain this it was necessary first to find a method by which to lay down the exact relations of the teeth to the facial lines and to reproduce in a plaster model the head as well as the teeth in this relation. Ruppe's gnathometer does certainly reproduce the relation of the teeth to the facial line, but this method seems to me less exact, because one has to put between the lips, and even between the teeth, a part or parts of the apparatus. A more exact method, according to my idea, is as follows: Take a plaster impression in the median line of the forehead, bridge of the nose, point of the nose, and middle part of the upper lip, and let the plaster run into the vestibulum oris, which must then be brought into contact with the plaster on the face, while the patient holds the teeth in occlusion. For this purpose the lips must be held apart. The impression thus obtained reproduces the forehead, bridge of the nose, upper lip (not in the position assumed in a state of repose,) and the labial and incisal surfaces of the front teeth of the upper jaw. Hereby is obtained the relation of the upper teeth to the part of the facial line that can be judged as fixed, the forehead and the bridge of the nose. Afterward, an impression in plaster is taken of the upper jaw, and the model is placed against the facial impression so that the front teeth of the upper jaw fit into their impression on the facial negative, and in this relation the upper model is fixed on the facial impression. The top of the upper model is then covered with a sheet of wax, and a positive cast of this facial impression is made. Thus a positive is obtained that shows clearly the position of the upper model in relation to the forehead and bridge of the nose. Against the palate of this positive, some impression compound is placed that fills up the palate, and in it is fixed a strong bar of German silver which runs transversely behind the upper model or it can be so fixed that it first runs in the impression compound in the direction of the raphe, then comes into sight, and now may be bent toward the top. Then a plaster impression is taken of the face, *i.e.* of the physiognomy in a state of repose, and upper the model is placed with the positive of the forehead and the bridge of the nose fixed to it. The lips have been cut off, as they do not have the correct position in this negative of the face, in which it fits in one way only. Now we have the upper model in exact relation to the impression of the face. Both extremities of the bar, if it stands transversely, or only one extremity if it stands sagittally, are fixed in the negative of the face, while the forehead and the bridge of the nose are placed in their correct position, and the impression compound is pressed against the palate. Thus the impression compound by means of the bar is fixed in the exact position in the negative of the face. The wax plate on the upper model is then softened, when the positive of the forehead and bridge of the nose is removed, and next the upper model—removing them together is impossible owing to the undercut. If a positive is now made of this negative, then the impression compound is fixed in this positive in the correct position, so that one has now the model of the head of the patient, with the impression compound in the middle, which gives us the position of the upper jaw, and where it fits exactly on the upper model. If we now fix the lower model with wax against the upper model in exact occlusion we have attained our object—we have reproduced the exact position of the teeth and alveolar process in relation to the facial lines.

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EDITORIALS

The Eastman Dental Infirmary.

Rochester, New York, is following closely in the wake of Boston.

The Forsyth Infirmary is to have a close second in the Eastman Infirmary, made possible by the generosity and philanthropy of Mr. Eastman of kodak fame.

The establishment of institutions of this kind indicates that philanthropists are thinking along right lines, and that they are being wisely advised by their dentist and pyhsician.

In the January issue of the International Journal of Orthodontia, in commenting upon the Forsyth Dental Infirmary, we expressed the hope that real tangible dental knowledge would result from the clinics conducted in this institution. We pointed out, however, that this institution would fall short of its purpose and disappoint its founders, if it failed to utilize for the betterment of dentistry the clinic material that would come to it.

The waste of material in medical clinics in America is a travesty on American medicine, and it is hoped that the Forsyth Infirmary will not follow in the footsteps of many of our medical clinics. The Eastman Infirmary would do well to look sharply to the utilization of all the material offered it.

If possible a research laboratory should be established to work with the clinicians. For a few more thousand per year such a laboratory could be maintained. Its benefits to society would be invaluable, and the purpose of the laboratory would more nearly fulfill the purpose of its founder.

The clinicians working in institutions of this kind should carefully tabulate their cases and keep accurate records of their findings and the therapeutic measures adopted. Such records extending over a period of years would become invaluable. Buildings never made "per se" a university or a hospital. It is the work done in them by the teachers and the clinicians that has been of value to the world.

Let not the friends of the Forsyth and the Eastman Infirmaries have their magnificient gifts to humanity render less effective (by a lack of realization on the part of those who conduct them) the tremendous advantages that can arise by properly utilizing all the clinic material, and the preserving of all data pertaining to their cases. By doing this, society today, tomorrow next year, and in the next decade, will receive the benefit intended for them by the founders of these institutions.

The Dental Horizon.

The dentist who has looked upon his profession as being only an improvement over that of the plumber is finding himself strangely like that of the Arab, famous in poetry and in song; and, like that personage, will soon be folding up his tent and silently stealing away.

Dentistry is making such strides that by the next decade its position among the learned professions will be established, and it will be in such close relationship with medicine that there will be wide-spread intermingling of these professions.

Why is it not, therefore, necessary that a dentist have a broad, liberal education? Surely the work he is called upon to do, if well done, demands an understanding of interrelated sciences. He should know pathology in its broadest sense, should be thoroughly familiar with bacteriology and should understand the principles of vaccine and serum therapy. He should be an adept in diagnosis; not alone in deseases of the mouth, but be able to interpret the symptoms manifesting themselves in the mouth, of systemic diseases. He should be a competent embryologist, and thus understand the malformations of the mouth and jaws that come under his observation for treatment.

Physiological chemistry should not be a closed book to him, because it is necessary that he understand digestion and the part played in it by the secretion of the glands in the mouth and stomach. The recent investigation in the etiology and treatment of pyorrhea is convincing proof of how necessary it is that he thoroughly understand bacteriology and vaccine therapy.

He should know enough of general medicine to advise his patients of the possibility of endocarditis and of the almost certainty of arthritis from a neglected pyorrhea. He should know the intimate relationship between migraine and diseased teeth, and be able to detect the hidden diseases of

metabolism, manifest in child life by symptoms in the mouth and teeth. With all this he must be a good mechanic, a metallurgist, a skilled technician, and should have a correct understanding of facial art.

With this conception of dentistry, who would restrict the Dentist's Mental Horizon by denying that before a student takes up the study of this art and science, he should not have a broad educational foundation?

There is no logic in the statement that a practical dentist or physician is of more value to society than the one highly educated and trained. The only difference is in favor of the patient who is served by the one better trained. There are prodigies of course in all the learned professions, but who dares think it necessary to split rails or drive a tow-boat in order to practice law and become a national president. Lincoln and Garfield were accidents. Occasionally you see a good dentist develop from uneducated and ill-trained material; but the occurrence is rare. Dental education is a serious undertaking, and those engaged in it should recognize its seriousness. No effort should be spared on their part to recruit the ranks of dentistry with students who have a broad liberal education in the sciences, and who will develop into dentists with a horizon limitless in its scientific expanse.